ELECTRICAL REVIEW

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ELECTRICAL REVIEW

14 May 1954 Vol. 154 No. 20 Established 1872

High Voltage Transmission

DISPARITY between sources of power (to which must now be added atomic energy) and electrical demands in nearby centres of population becomes increasingly more pronounced. Obstacles to relating points of generation with those of use, however, are being steadily overcome, though not more quickly than the future is likely to require. Such obstacles, whether set by geographical features such as rivers, seas and mountains, irrespective of national frontiers, or by mere distance, pose technical problems that call for the pooling of technical knowledge and experience on an international scale.

The immediacy of the need to find solutions of these problems is reflected in numerous papers now being discussed before the Conférence des Grands Réseaux Electriques (C.I.G.R.E.) in Paris, which give evidence that subjects whose interest only a few years back was mainly theoretical are now in the forefront of actual development. These data, freely published, encourage expectations that advanced thought will continue to be put into functional shape with success. Fulfilment of the main conception does not mean finality, however, since schemes initiated in the light of the best technological information available at the time can almost always be improved by later progress in electrical science and engineering, which is continuous.

Improvements envisaged are especially in the direction of securing greater economy in construction, operation and maintenance, accompanied by reliability, with the simplification in design which these usually imply. How much is possible in this way provides subjects for many papers which support or, with the aid of discussions on points arranged by group reporters, constructively criticize the various proposals made. Notable examples of re-examination of items in schemes in their early stages are provided by two papers on the British 275 kV supergrid.

The predominant feature of the C.I.G.R.E. proceedings is naturally the use of high voltages, which also provides an appropriate keynote for the jubilee of the Ecole Supérieure d'Electricité which is being celebrated also this week in Paris. Transmission voltages have been doubled every twenty years or so—a trend that seems likely to continue. This raises the question whether alternating current will for long retain its supremacy for point-to-point transmission, as distinct from more localized interconnected high voltage networks. Already direct current shows promise for relatively short under-water connections and the single paper (Japanese) allocated to the subject refers to this aspect for a scheme comparable with the Swedish prototype which has recently been placed in commission.

Much remains to be done, however, before a.c./d.c./a.c. conversion of any considerable magnitude becomes feasible and no doubt more will be heard of such developments at future C.I.G.R.E. meetings. Important as the exchange of technical information on advances in high voltage engineering undoubtedly is of itself, the opportunities provided by the Conference for more informal contacts between electrical engineers of different countries is a most desirable accompaniment.

ELECTRICITY FROM ATOMIC ENERGY

Once again last week there was a spate of statements in the lay Press about the development of atomic energy, largely to the effect that because of recent progress made in the protection of operatives against radiation, the generation of electricity from atomic energy was likely to be brought considerably nearer. Protection against radiation is of vital importance, of course, and we have no doubt that developments in this direction will have important effects in speeding things up. In his article dealing with the generation of electricity from atomic energy in the *Electrical Review* of 23rd April, Dr. Bauer, of the Atomic Energy Research Establishment at Harwell, emphasized the hazard of atomic radiation, but he also stressed in the main that the generation of electricity from atomic energy on a commercial basis would be a fairly remote development for two main reasons. One is the very high cost of nuclear reactor equipment and the other is that so very much will have to be done in evolving the technique of heat transfer from the reactor to the steam generator. At the experimental power station at Calder Hall, the steam conditions are very much outdated when compared with modern coal-fired power stations, and the boiler proper seems to compare well with the waste heat boiler. The introduction of " atomic " power stations is of particular importance to the electrical industry, but it is also necessary that the true perspective of development should not be lost as a result of over optimistic statements.

RESUSCITATION FROM SHOCK

For many years the *Electrical Review's* " Suggestions for Dealing with Apparent Death from Electric Shock " has been a familiar sight in factories of all kinds. The electrical regulations made under the Factories Acts require the prominent display of such an instruction sheet. The operations set out in the placard were based on the Schaefer system of artificial respiration, but expert opinion has gradually inclined towards the Holger Nielsen method. In consequence of this we have undertaken a revision of the placard and the new form is now available. In the preparation of the revised instructions we have had the valuable co-operation of Lt.-Col. Holger Nielsen (of Denmark) and Mr. H. W. Swann who was for over thirty years an Electrical Inspector of Factories and Senior Inspector for the bulk of that time. In this issue Mr. Swann, from his intensive study and long experience of the subject, deals generally with resuscitation methods and explains why the Holger Nielsen system is now favoured. We think that readers will find Mr. Swann's survey an interesting and informative introduction of our new wall sheet.

HIDDEN HEATING

In this issue Mr. P. S. Watson (South Eastern Electricity Board) describes a good example of building heating by means of cables buried in the floor—a system which has a number of merits. This was one of the installations mentioned in the recent E.D.A. conference paper by Mr. J. W. Moule, of the South East Scotland Electricity Board. Among the advantages of floor warming enumerated by Mr. Moule were that it simplified building construction, was unobtrusive, provided heat from the right quarter for maximum comfort, reduced draughts, and was cheaper to install and generally cheaper to operate than other heating systems. Also, in common with other electric heating methods, it did away with the trouble involved in maintaining and fuelling non-electric services. All these merits are obviously being recognized for the number of floor warming installations is increasing quite rapidly.

RAILWAY ELECTRIFICATION

From many aspects the electrification of British railways is desirable and even essential. All reports on the subject have stressed the benefits which electrification bestows in the way of simplified operation and fuel saving and in a number of other directions. Next week the first International Railway Congress to meet in London since 1925 is being held and we are taking the opportunity afforded by this important gathering of railwaymen to produce a special issue dealing with railway electrification from several points of view. The principal article, dealing with the economics involved, will be by Mr. C. M. Cock, who was chairman of the Committee on the Electrification of Railways appointed by the Railway and London Transport Executives in 1948 and whose report appeared in 1951. It will be followed by articles viewing the subject from the operator's, the electrical manufacturer's and the electricity supply authority's angles. Illustrated descriptions of electrification schemes at home and overseas will also be included, and there will be a list of manufacturers of electric railway and associated equipment.

ENGINEERING WAGES

Evidence of anxiety to avoid conflict in the engineering industry was displayed at last week's conference of the National Committee of the Amalgamated Engineering Union at Blackpool. There was heavy pressure upon the committee to seek an immediate wage rise of 10 per cent, to complete the 16 per cent sought last year (6 per cent being conceded by the employers). A demand was also made for minima of £9 a week for skilled workers and £7 10s for unskilled men. The majority of the members took a realistic view of the position, being aware that the employers, for reasons which they have already stated, would resist any further claim. Instead the final decision was that the wages structure of the industry should be overhauled, an operation which is recognized to be necessary by all concerned. There is apparently a hope that a reconstruction of the wages system would carry with it some increases where these could be justified although the operation would undoubtedly take some time. It remains to be seen whether the A.E.U.'s partners in the Confederation of Shipbuilding and Engineering Unions will follow the lead given.

Electricity and Steel

Extended Field of Application of the Electrode Arc Furnace

By R. L. GAUNT*

THE Battelle Report[1] can be described as an impartial report by the Battelle Memorial Institute at the invitation of some fourteen of the larger electricity supply undertakings in the United States. Apart from this electricity supply group, it was also sponsored by Bituminous Coal Research, Incorporated, which makes the conclusions all the more impartial and important from an electrical point of view. It should have a wide circulation in this country, but for those unable to study this comprehensive survey an excellent summary has been prepared by Mr. A. G. Robiette[2], and this gives a very concise summing up of the position from a consulting engineer's point of view. The report should be of interest in the heavy-industry areas in this country, particularly Sheffield, the North-East Coast, the Midlands and South Wales, where there is a concentration of output of iron and steel.

In this article the author discusses the economic conclusions that can be drawn from the Battelle Report (U.S.A.), types and characteristics of furnaces and typical electricity supply arrangements. Existing furnaces are referred to as well as the possibility of extensive development in electric furnaces for dealing with low carbon steel

The metallurgical engineer has very definite views on the best methods of producing low carbon steel and the practice in this country has been to use the open hearth furnace, but the Battelle Report discloses that this can be done cheaper by an electric arc furnace and thereby there is open to the supply industry a large field of electrical development because the majority of the steel manufactured in this country is of low carbon content. The economic conclusions specifically referred to in the Battelle Report show that the electric arc furnaces have a cost per ton of output lower than the open hearth furnace commonly used both in America and in this country for that type of steel.

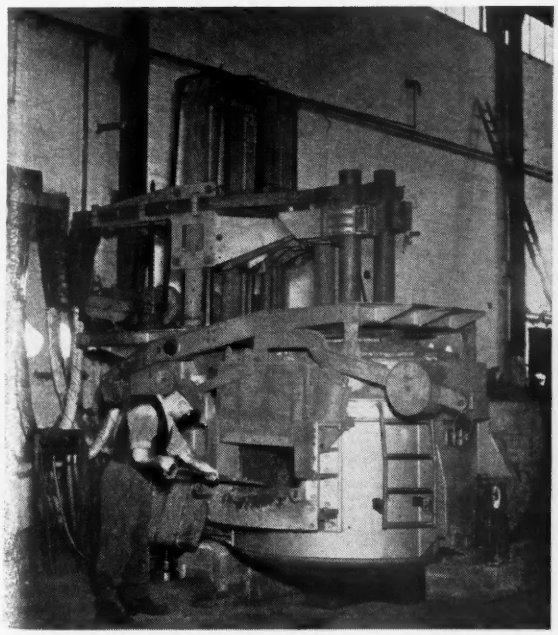
The higher grades of steel for which smaller quantities are required have for some time been manufactured in electric arc furnaces and because of the high quality steel required the metallurgical engineer has accepted this type of furnace as the one best suited to his needs for such steel. A further economic approach to this problem would be to assess the cost of electricity as a percentage of the cost of production and it is to be regretted that the Battelle Report gives no information on this point, because this is more important than the precise cost per kWh.

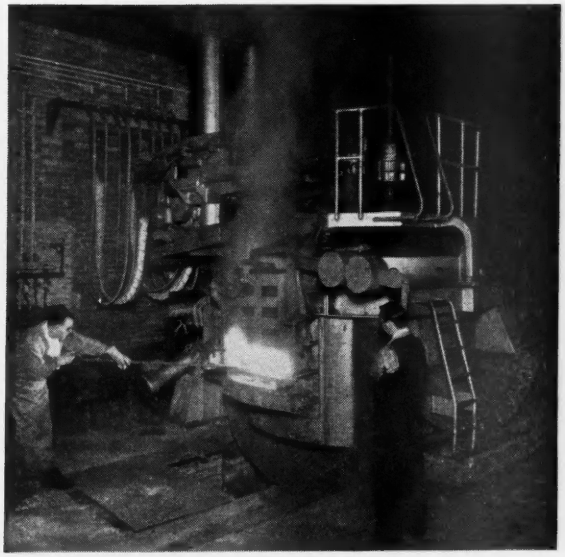
In many other trades the cost of electricity per yard of material or per ton of output expressed as a percentage of the total cost of production has been a measure of the success or otherwise of adopting electric drive and a similar approach to the adoption of electric furnaces would reveal the economics of the case.

* Mr. Gaunt is Assistant Chief Commercial Officer, Yorkshire Electricity Board.

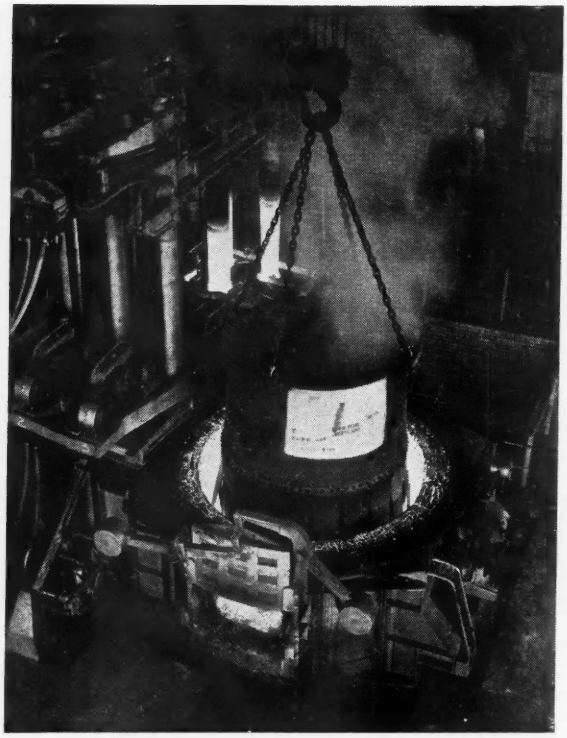
[1] "Comparative Economics of Open Hearth and Electric Furnaces for Production of Low Carbon Steel." Report prepared by the Battelle Memorial Institute, 505 King Avenue, Columbus 1, Ohio, and published July, 1953, by Bituminous Coal Research, Inc., 2609 First National Bank Building, Pittsburg 22, Pa.

[2] "Electric *v.* Open-hearth Furnaces," by A. G. Robiette. *Iron and Coal Trades Review*, 27th November, 1953, p. 1231.



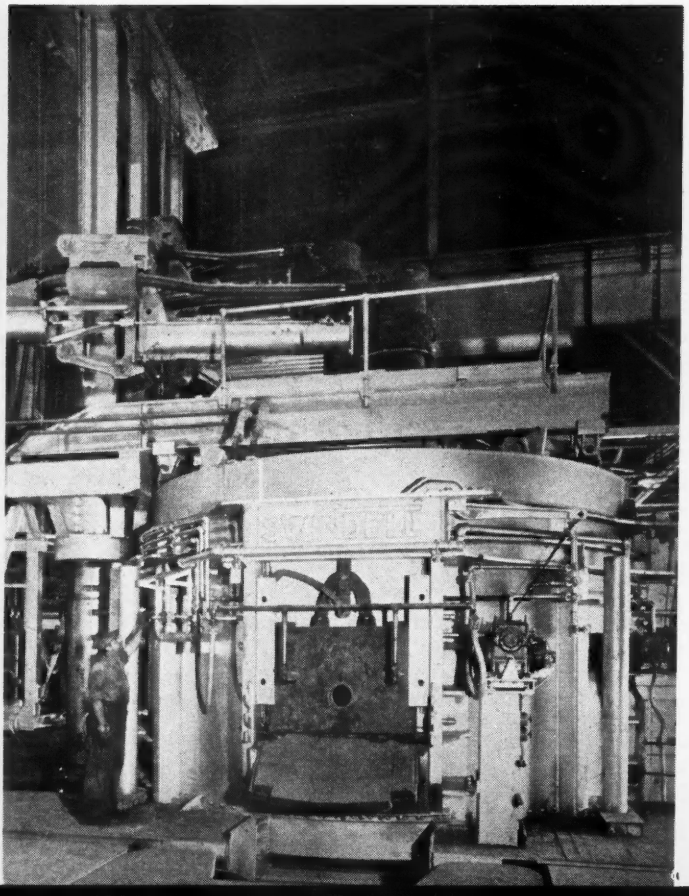


On the left is shown a two-ton 1,000 kVA swing-roof EFCO-Heroult arc furnace and above a five-ton 2,000 kVA furnace of similar type



Ten-ton 3,500 kVA swing-roof EFCO-Heroult arc furnace, with roof swung aside and charging basket in position

Eighty-ton Swindell-Dressler swing-roof arc furnace



The entry of the electric arc furnace into the wider field of lower carbon steel may have considerable influence on our present methods of production, apart from the cheaper cost per ton of metal, because the new type of furnace will call for a new approach to the design of workshop layout which in itself will affect the general economic position, particularly from the employees' point of view.

The development of the electric arc furnace in this country has been slow measured by the progress of electrification in other industries although there is a very varied application of electric heat in industry apart from the arc furnace, and perhaps a brief reference to the various types of furnaces now in use will be of interest. For the large melting load the arc furnace has been generally adopted; for the smaller quantities melting is carried out by the induction furnace; and the resistance furnace is used for heat treatment.

Induction furnaces are divided into two groups; (*a*) those using a.c. from the normal supply, and (*b*) those using high frequency with some form of frequency convertor. In the first group the power factor is high and the heat transfer is the most efficient method of conversion and there are likely to be new uses to which this type of furnace will be applied. In the second group the high frequency furnace has a very low power factor and on that account it brings problems with the design of the furnace body. Resistance furnaces are now an important item for heat treatment of all metals and their multiplicity of application is an indication of their development and attractiveness from the metallurgists' point of view.

The arc furnace used for melting and refining varies in size from relatively small tonnages to those of a furnace of 60 tons capacity which, so far as is known in this country, is the largest one now being installed. From the supply authorities' point of view the load of an electric arc furnace during the melting time fluctuates considerably due to the striking of the arc and this may cause some interference with the supply to other consumers, but much depends upon the method of providing the supply and on that account it is important to know beforehand the full characteristics of the furnace to be installed.

The violent fluctuations in load (Fig. 1) continue to occur until there is molten metal in the furnace which enables a steady arc to operate and until this stage is reached in the melting period there may be a demand on the supply authority varying from no load to as much as four times the normal full load of the furnace, and these conditions may continue for as long as an hour or two during each separate charge dealt with by the furnace. After the melting period the load conditions remain fairly stable and also more or less within the normal full load of the furnace with a gradual reduction in load during the final stages of refining.

This type of furnace calls for continuous operation to obtain the greatest advantage, not only to recover the capital cost of the installation but also to limit the losses which originate from intermittent operation. One of the largest losses is that through radiation owing to the large mass of material going to make up the furnace radiating heat quickly when the furnace is not in use and the necessity to restore this heat when the furnace is restarted. The methods of charging the furnace are all designed to reduce this loss and present day methods indicate the improvements that have been made in reducing the charging time to the minimum.

Typical Supply Arrangements

The electricity supply arrangements to deal with loads called for by 30 ton and 60 ton furnaces require careful consideration and a settlement of the position of the

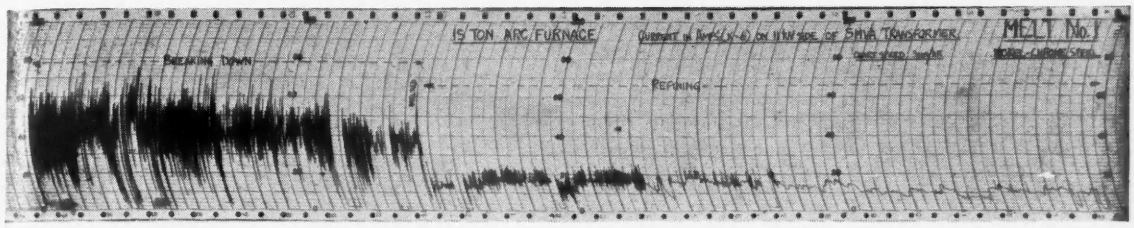


Fig. 1.—Ammeter chart recording of typical large arc furnace load

furnace and its associated equipment at an early stage of the negotiations assists the supply authority materially in designing an extension to its system to deal with that load. For furnaces of that size requiring some 15,000 kVA it will be necessary, generally speaking, to extend at either 33 or 66 kV to a separate substation at the consumer's premises where the supply would be transformed by the Board's equipment and taken at high voltage to the furnace transformer situated alongside the furnace and designed primarily for supplying that particular unit.

The provision of a separate high voltage substation on the consumer's works to feed this type of load may not be justified in every case; but there is an advantage in adopting this procedure as it does remove to a large degree the possibility of interference with the supply to other consumers. It also avoids interference with the supply of electricity to that particular consumer himself, as experience has shown in the past that even if the office mechanized accountancy machines are supplied from the same substation as the arc furnace they may be put out of action by the variations in the system caused by the operation of the furnace. This proved to be so troublesome in one case that steps were taken eventually to provide the supply to the office machinery from a separate source unaffected by the fluctuations in load due to the arc furnace.

Supply would be provided either by a single tee or by a loop-in of the extra high voltage system thereby providing an alternative source of supply with either one or two step down transformers according to the size and security of the supply, and because of the reliability of the present day transformer it is not unreasonable to rely upon one step down transformer at the supply point (Fig. 2) to provide supply to one furnace.

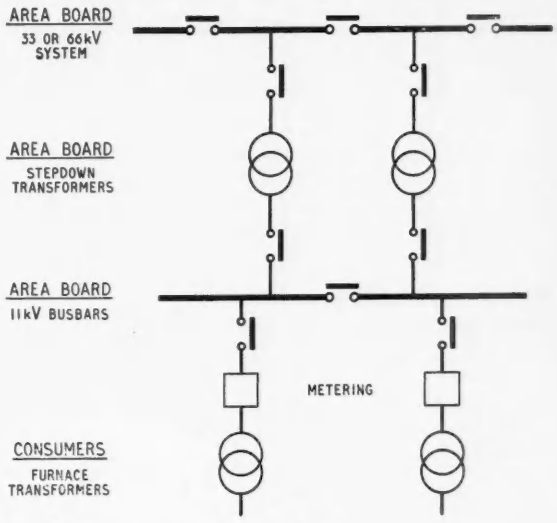
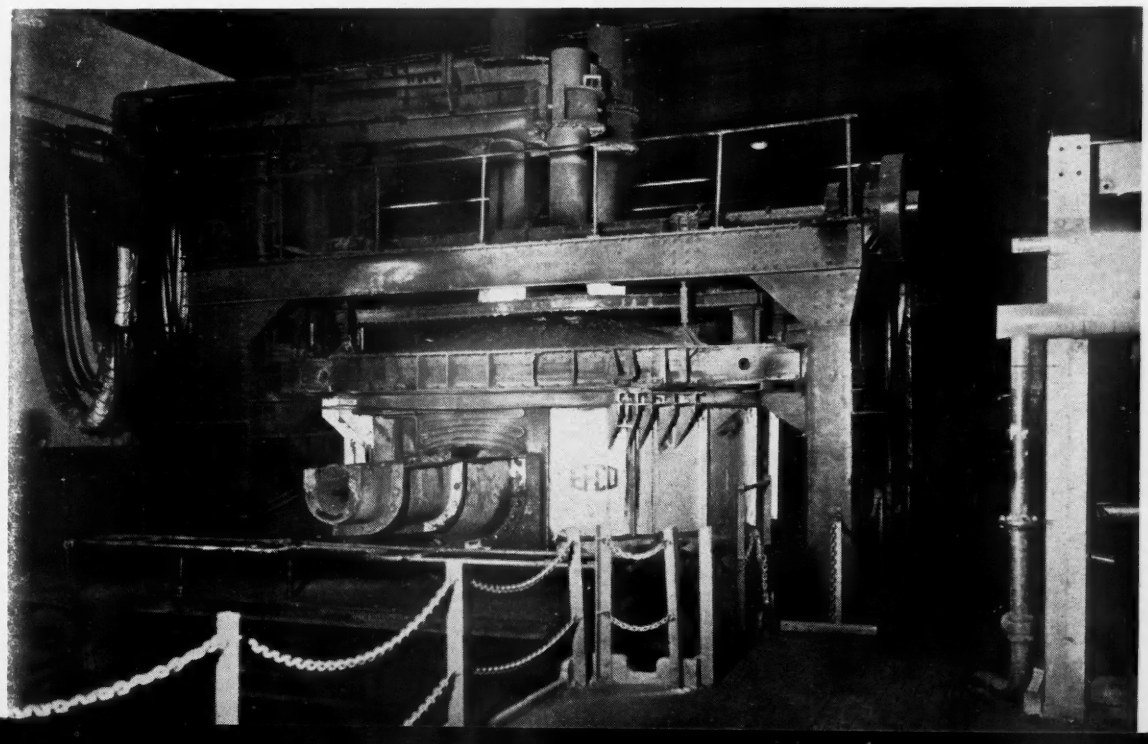


Fig. 2.—Typical h.v. substation arrangement supplying large furnace load

For the smaller electric arc furnaces which are really part and parcel of a normal works load, there is not the need to provide such an elaborate arrangement as this will be taken care of in the general supply arrangements to the works itself, and again the question of security depends largely on the extent to which the consumer himself requires duplication of his own system.

Twenty-ton 6,000 kVA body run-out, body-rotating EFCO-Heroult arc furnace



The existing electric arc furnaces vary considerably in their capacity and application, but it can be said that generally throughout the country they have been installed for the specific purpose of producing a high grade steel and it is without doubt that they have proved to be economical and satisfactory from the metallurgical point of view. The proposed manufacture of low carbon steel by electric arc furnaces will introduce designs of furnaces beyond the capacity of those now in use and probably the existing arc furnaces may not be a true indication of the class of load that is likely to be obtained in the future. Mr. J. C. Howard, a director of the Electric Furnace Co., Ltd., recently gave lectures in this country on the American and Canadian practices following his visit to those countries which should do much to influence our own steel makers to adopt arc furnaces.

The attractiveness or otherwise of adopting electric furnaces is, we are told, entirely dependent upon the cost of electricity supply, but one feels this is not entirely correct because in many figures concerned with the adoption of this type of furnace where it has been associated with a normal steelworks load, it has seldom been shown that an electric furnace is so much more expensive than the alternative types available. One is rather led to believe that the ease of control, and the quality of the manufactured steel is so high, that the manufacturer is not seriously concerned with the electricity costs per ton of output, compared with his total cost of producing that steel.

There are many aspects of the operational control of industrial electric heating which have not been mentioned because of their wide range, and it is hoped this and other kindred items of interest will be covered by later articles. The electric furnace load in this country has been built up over many years and the electricity supply industry has made energetic efforts to encourage its development and there is no reason to suppose there will be any change in the industry's attitude towards that policy.

The steelmaker may be critical of the present day costs of electricity supply and the possibility of increases in the future may make him hesitate to adopt electricity as his source of furnace heating, but he no doubt appreciates to-day that the cost of electricity is more attractive compared with its competitors because the cost of other sources of fuel has risen by a far greater extent than has the cost of electricity.

In the area of the Yorkshire Electricity Board the cost of supply to industrial consumers, including some 500 million kWh a year for electric furnaces, is the second lowest in the country, namely 0·901d kWh for the year ended 31st March, 1953, in spite of the considerable increases during the last few years in the cost of coal and distribution equipment.

The author gratefully acknowledges the permission given by Mr. D. Bellamy, O.B.E., D.L., Chairman of the Yorkshire Electricity Board, which enables this article to be published, and the valuable assistance of his colleagues in the industry. The views expressed should not be taken as those of the Yorkshire Electricity Board.

International Railway Congress

THE first International Railway Congress to be held in Great Britain since 1925 will meet in London from 19th to 26th May, with over 450 delegates from more than 30 different countries. H.R.H. the Duke of Gloucester, honorary president, will formally open the Congress at Church House, Westminster, on Wednesday, 19th May, and will be supported by the Rt. Hon. Alan Lennox-Boyd, M.P., Minister of Transport and Civil Aviation; M. de Vos, president of the International Railway Congress Association and general manager of the Belgian National Railways; Sir Brian Robertson, chairman of the British Transport Commission; Sir John Benstead, deputy chairman, and other members of the Commission; Sir John Elliot, chairman, London Transport Executive, and civic representatives.

In addition to seven business sessions and sectional discussions at Church House, delegates will visit important railway centres, and will inspect recent examples of technical development on British Railways and London Transport. Such visits will include the Willesden carriage cleaning and servicing depot; electrical control rooms and substations on the Southern Region electrified system; the Swindon locomotive, carriage and wagon works; London Transport workshops and depots at Lillie Bridge and Acton; Southampton Docks; the Liverpool Street–Shenfield electrification scheme; the London Transport Central Line underground extension; the Rugby locomotive testing station; and railway coastal protection works between Dover and Folkestone.

There will also be a special exhibition of British Railways and London Transport locomotives, rolling stock, civil and signal engineering equipment at Willesden, and this will be open to the public from 26th to 29th May.

The subjects to be discussed at the Congress include:— Technical and economic investigation of the basic characteristics of electric traction systems now in use, with a view to deciding whether, and to what extent, there are relevant reasons for preferring one system to another; in particular, are there any reasons in regard to (*a*) power supply, (*b*) overhead line and fixed track installations, (*c*) motive power units, (*d*) working and maintenance costs? The authors in this case are Dr. C. Guzzanti, Italian Ministry of Transport, and Mr. S. B. Warder, chief officer (electrical engineering), British Railways.

Radiophonic communications in railway working: The authors are Mr. J. Frischauf, chief officer (telecommunications), Austrian Federal Railways, Mr. S. G. Hearn, operating superintendent, London Midland Region, British Railways, and Mr. J. H. Fraser, chief officer engineering (signal and telecommunications), British Railways.

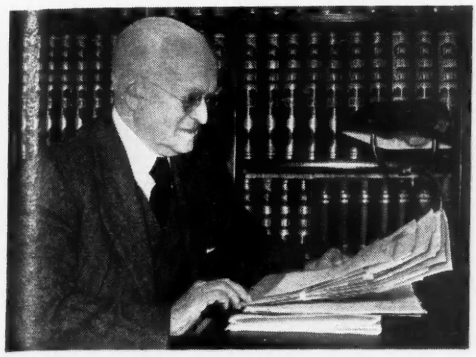
Remote operating of signal boxes, electrical working and control devices for hinged and flexible points and switches: The authors are Mr. M. J. Nogues, deputy manager, Spanish National Railways, Mr. H. Grünewald, chief officer, central technical office, German Federal Railways, and Mr. Sorvik, resident engineer, Electrical Department, Norwegian State Railways.

Protection of overhead lines, substations, locomotives and motor coaches against accidents of an electrical nature (excess voltage, overloads, short-circuits, lightning): In this case the authors are M. De Boeck, chief engineer (rolling stock and motive power), Belgian Vicinal Railways, and Mr. T. S. Pick, chief electrical engineer, London Transport Executive.

Apparent Death from Electric Shock

A Study of Resuscitation Methods

By H. W. SWANN, O.B.E., D.F.H., M.I.E.E.*



WHEN one has been writing about a subject with some degree of regularity for a number of years it is a good plan to look at the earlier efforts before attempting further essays. The first point which comes into my mind, after looking back, is that I have contributed nothing original and that what I have said has been based mainly on other people's unfortunate experience. To this I have added what I have learned from those who have studied the subject closely and evolved methods of artificial respiration as a result of their researches.

The second point which occurs to me is that throughout the years I have referred to people being "unconscious" without qualification as to degree, and I think this was right, although the late Dr. Joad might have said that it all depends on what the term means. In the practical sense it would be most unwise to waste time in trying to find out whether a victim of electric shock has really stopped breathing, or has no pulse, and thus it is better to accept anything which looks like unconsciousness as the real thing and get to work at once. Dr. Joad would, however, also have been right in raising the question of degree, because it is otherwise difficult to explain some of the cases of unaided recovery which are on record, together with those where quite unorthodox methods have been successfully employed.

For instance in 1946 there were five cases in which unconsciousness was said to be "complete" and in which no artificial respiration was attempted. Three of them died but two came round, one after fifteen minutes. There was in 1949 the unusual case of an unconscious wireman's mate being "walked" up and down a hospital corridor supported between two men until he showed signs of revival, after which he was given hot black coffee and an injection. He is reported to have resumed work after an hour or so, but if he really did I should think it was very bad for him.

It is unsafe to generalize from particular cases but it seems reasonable to think firstly that the depth of unconsciousness varies, as it does in anæsthesia, and secondly that first aid which applies some sort of stimulus may be useful even if not so effective as the recognized methods of resuscitation.

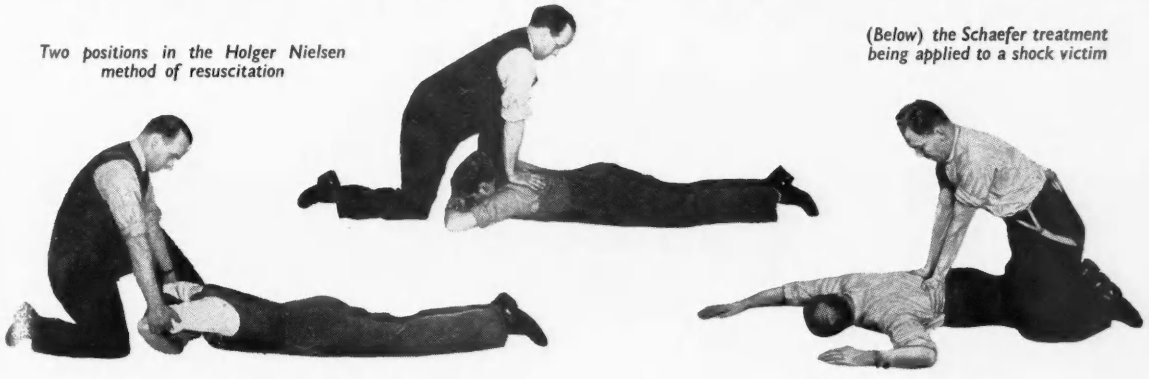
This point leads me to mention the apparent value of counter-shock and the opinion of the late Sir Thomas Legge, one-time Senior Medical Inspector of Factories. I had told him of cases of fall following electric shock, such as from a ladder after touching crane trolley conductors, in which the victims were seldom unconscious unless mechanical injuries were sustained in addition. He thought these cases supported his views on the probable efficacy of counter-shock and suggested hitting unconscious victims with a wet towel, but he agreed that this, and measures of a similar character, might be misunderstood. The counter-shock of a fall, or perhaps of unintentional violence at the outset of rescue work, does however stand a chance of being effective if only because it is immediate and thus well within the period of 10 minutes during which most recoveries are achieved.

I think it was in 1945 that it was suggested to me that an analysis should be made of cases where artificial respiration had been applied, distinguishing between successful and unsuccessful results. This was done and detailed statistics have been published for several years based on the reports of the inspectors who investigated the accidents. These have brought out the fact that in each year some 20 recoveries are effected against much the same number of failures. This curious balance is maintained over successive five-year periods; for instance between 1945 and 1949 the figures were 106 and 105 respectively. The importance of a quick start is well established, but the statistics also record frequent cases of recovery after one hour's application with the more exceptional instances of success after two, or even three, hours of persistent effort.

* Formerly H.M. Senior Electrical Inspector of Factories.

Two positions in the Holger Nielsen method of resuscitation

(Below) the Schaefer treatment being applied to a shock victim



In the majority of non-successful cases efforts to restore consciousness were not carried on for longer than one hour.

The most outstanding fact, which I emphasize again because it is the most important, is that most recoveries occur in the first few minutes. It has indeed been stated on the authority of Continental researches that there is a 95 per cent chance of success if artificial respiration can be started within one minute of the accident.

A good deal depends on the physical work entailed by, and the relative simplicity of, a system of artificial respiration. In these respects I think the Schaefer method is the most easily performed but I do not consider the Holger Nielsen, pressure-arms lift cycle, unduly fatiguing. When, however, the circumstances demand prolonged application, and there is no one with whom the work can be shared, I should think most people would be glad to change over to a rocking stretcher, if they could get it, and that this would be greatly to the benefit of the victim.

The Rocking Stretcher

The Eve Riley rocking or tilting stretcher system of resuscitation is considered by some high authorities to be the best so far devised. It is double-acting, the weight of the viscera being employed like a piston to compress and relax the elastic diaphragm between the chest and the abdominal region. In ordinary breathing this is going on all the time but the lungs are acting as the piston, pushing the diaphragm down as they expand on intake, its elasticity allowing it to follow the lung contraction as breath is expelled. It is reasonable to think that a method of revival which so closely follows the natural mechanics of breathing is likely to be successful especially as there is probably in addition some massaging effect on the heart and movement of blood in the large arteries as the victim is tilted. The actual operation of a rocking stretcher—just tilting the victim first one way up and then the other about 12 to 15 times a minute—is easy, and can be continued for a long time, a point which now seems to be assuming more importance in connection with a fibrillating heart.

This condition is one in which the heart beats like a wrist watch instead of like a grandfather clock, and doctors have generally told me that if this quivering action has been caused by the shock the victim is unlikely to recover. There now seems to be some tendency to revise this opinion and to consider that if resuscitation treatment can be continued long enough it may give the doctors a chance to get to work on the lines adopted in the operating theatre if the patient collapses.

The role of the rocking stretcher must of course be supplementary to ordinary manual methods of treatment and no one should ever wait a moment for it. If, and when, it arrives, the victim should be transferred quickly, the rocking being started at once, and thus the design of the lashings or straps used to secure the victim should allow of very rapid fastening.

Riley rocking stretcher in use (Siebe, Gorman & Co., Ltd.)

I have read of other mechanical methods which have been tried or suggested, and the simplicity of the Eve system is such that improvisation may be possible on occasion, but even if a stretcher is kept on the premises it would be unwise to relax any schemes of training or drill in manual resuscitation.

My correspondence in recent years with engineers on the other side of the Atlantic leads me to think that they may be ahead of us in practising artificial respiration as a regular drill for electrical workpeople. The chief safety officer of a large electricity supply organization has told me that he has authority to descend on a squad at work, designate a casualty, and supervise the rescue and resuscitation measures with which the team is expected to be familiar. I have advocated this sort of training here, but never with much hope of getting it adopted because the number of shock cases is not large and many people would think the innovation out of proportion to the likelihood of an accident. Thus it has often happened that when an emergency arises there is no one on the spot who knows what to do and the invaluable first few minutes are wasted. This is true also in cases of electric shock on domestic premises but I fear that I can offer no practicable suggestions in that direction although in 1949 there were 54 electrical fatalities in the home as against 24 in factories.

Ambulance service and trained first aid personnel have on occasion administered carbon dioxide as a restorative, either by itself or mixed with oxygen. CO_2 is initially a stimulant to the brain and respiratory centres but if inhalation is continued in cases where the respiration has nearly stopped, the expiration of CO_2 may be insufficient and I am told it begins to exert a narcotic effect. In recent years the Medical Research Council has indicated the disadvantages of CO_2 as a restorative and, whilst the use of oxygen may be a good thing, remedial measures involving the administration of gas, or drugs, can hardly rank as first aid and are more for trained personnel and the doctor.

Comparison of Methods

The points of most practical interest to an engineer which emerge from a study of the considerable volume of medical and other literature available on artificial respiration, are firstly that electric shock may cause paralysis of the nervous system controlling respiration and the action of the heart; and secondly that any method of resuscitation should aim at starting them again artificially until the paralysed nerves recover sufficiently to resume their function. There are several methods, which have been shown by experience to be capable of contributing to this end, such as the Sylvester, Schaefer, Holger Nielsen, American Emerson, or the late Dr. F. C. Eve's rocking stretcher. They have been studied in research laboratories with a view to determining their relative value in the restoration of breathing and circulation, even to the extent of first inducing paralysis of respiration by injecting curare. There now seems to be a general consensus of opinion in favour of methods which are capable of assisting both inspiration and expiration as distinct from a method which, whilst positively encouraging expiration, relies on the victim's natural reflex for the corresponding intake. It seems to be established that the small natural intake of an unconscious person may be insufficient to oxygenate the blood and thus promote circulation with a resumption of normal breathing.

In this country many of the placards of instruction on artificial respiration, which are affixed in factories as required by the Electricity Regulations, describe and illustrate the treatment devised by Professor Sir E. A. Schaefer, F.R.S., which has been widely adopted and was probably used in the majority of the cases of recovery to which I referred earlier. It was also probably used in most of the approximately equal number of cases which were not attended by success and as it is essentially a method confined to rhythmic pressure in the lumbar region, and thus to causing expiration, it is probable that the treatment introduced in 1932 by Lieut.-Colonel Holger Nielsen, of Denmark, which stimulates both inspiration and expiration, would have been more successful.

It does seem to me, looking at the matter without any special knowledge or bias, that if a double-acting method is possible it corresponds more nearly to nature's requirements and in recent years I have recommended the Holger Nielsen treatment, thus following the example of the Royal Life Saving Society and adopting the views of my former colleague, Mr. Donald Picken, who has made an extensive study of the subject in consultation with eminent Continental authorities.

In conclusion I wish to acknowledge the assistance of Mr. Donald A. Picken, M.I.E.E., and Dr. C. A. Boucher.

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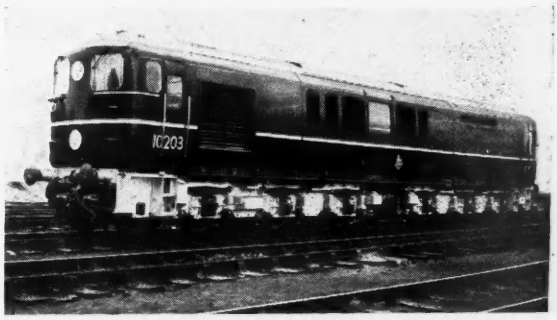
The Electrical Review's *new instructions for dealing with cases of apparent death from electric shock, based on the Holger Nielsen system, are available in the following forms:*

20in × 15in printed in red and black, on chrome art paper, 8d each (by post 10d); mounted on cardboard and varnished 5s (by post 6s); or printed direct on aluminium sheet and varnished 8s (by post 9s).

DIESEL-ELECTRIC LOCOMOTIVE

A 2,000 h.p. 1 Co-Co 1 diesel-electric locomotive has just been completed at the Brighton Works of the Southern Region of British Railways. This is the fifth large main line diesel-electric locomotive to be built for British Railways and is externally similar to the two earlier 1,750 h.p. Southern Region locomotives.

This locomotive weighs 132·8 tons of which 109·5 tons are adhesive with a maximum axle load of 18·6 tons. The leading dimensions are identical with the two 1,750 h.p. locomotives but the starting tractive effort is 50,000 lb and the continuous rating 30,000 lb at 19·5 m.p.h. The maximum speed is 90 m.p.h. The six driving axles are each driven by a six-pole nose-suspended motor through single reduction straight spur gearing with a ratio of 19 : 61. Supplies include 1,180 gallons of fuel oil, 160 gallons of lubricating oil, 280 gallons of engine cooling water and 840 gallons of water for train heating. Braking equipment is Westinghouse straight air for the locomotive and vacuum equipment for the train.



2,000 h.p. main line mixed traffic diesel-electric locomotive for the Southern Region

Both driving cabs are practically identical and the controls are grouped on the left-hand side. The power equipment controls are of the simplest nature and consist of two handles; the main power handle which automatically gives full control of the engine throttle and electrical equipment and the master switch handle, both interlocked. The latter has four positions, viz.: " Off," " Forward," " Engine only " and " Reverse," whilst the former gives infinitely variable (notchless) power output control.

The 16 cylinder English Electric diesel engine has a continuous traction rating of 2,000 b.h.p. at 850 r.p.m. and the input to the main generator, after allowing for all auxiliaries, is reckoned to be 1,880 b.h.p.

Electrical transmission and control is of the normal English Electric type. The ten-pole main generator is direct coupled to the engine and the shaft is extended to carry the armature of the auxiliary generator. At 850 r.p.m. the continuous rated current is 1,750 A and the maximum voltage is 965 V. The auxiliary generator is an eight-pole d.c. shunt wound machine rated at 48 kW, 135 V, 356 A at 850 r.p.m.

The six traction motors are of the six-pole series wound type force-ventilated, three motors being ventilated from each of two motor driven blowers. The motors are permanently connected in series-parallel there being three groups of two in series; each group is fed through a separate motor contactor.

Control equipment consists of electro-pneumatic and electro-magnetic unit and group switches, the main power contactors and reverser being of the electro-pneumatic type. The engine throttle gear is pneumatically operated from the master controllers, giving infinitely variable control. This control permits the utilization at all speeds of the full power output available from the engine, allowing it to function at all fractional loads, and prevents overloading of the engine as well as automatically controlling the field weakening of the traction motors at the correct instant. The load regulating equipment is basically the same in operation as that installed in locomotives Nos. 10201 and 10202, except that it operates over the full engine speed range.

The mechanical parts of the locomotive were built at the Ashford and Brighton Locomotive Works of the Southern Region. The power equipment was supplied and erected by the English Electric Co., Ltd., the whole being designed to the requirements of the Mechanical and Electrical Engineer.

View of stores site and buildings, showing how advantage has been taken of the slope of the land

Electric Floor Warming

210 *kW Installation in an Electricity Board's Stores*

By P. S. WATSON, M.I.E.E., A.M.I.I.A.*

A NEW stores for the West Kent District of the South Eastern Electricity Board has been established at St. Mary Cray, Orpington, in a road which has now been named Faraday Way. The two-acre site is on slightly sloping ground and full advantage has been taken of this feature. The loading bay of the main building is approximately at lorry platform level, one side of each hardstanding is at road level and the other at lorry platform level. Loading and unloading of equipment is thereby facilitated.

The building is a reinforced concrete barrel-arch structure, and the accommodation comprises the area with its storage bins for mains and trading equipment, offices and workshops, a large garage for heavy vehicles and a small one for the night storage of small vans and cars.

The chief technical interest lies in the method of space heating; floor warming using standard single-core Pyrotenax cables has been adopted. Heat is generated by the simple expedient of over-running the conductors until the central core reaches a temperature of about 130 deg F which is quite safe with these mineral insulated conductors. The total loading is 210 kW arranged in ten equal three-phase circuits running at 415 V.

In determining the capacity of the heating requirements the basic calculations took into account the thermal conductance of the external walls and roof, and the required temperatures in each enclosure. When related to the area of the floors the loading worked out at an average of 15 W/sq ft, a rule of thumb expectation. Slight variations of loading provide the required temperatures for the differing occupational activities of each room without individual heating circuits and thermostats. Very careful planning in the drawing office developed a layout which reduced feed circuit wiring to a very low minimum with a saving in cost.

The heating conductors are laid at a nominal depth of 2in directly in the concrete floor with a spacing of 4in. The accurate installing of some $7\frac{1}{2}$ miles of conductor presented a problem which has been staisfactorily solved. Two 12ft long wooden moulds were constructed and to them were screwed $\frac{1}{4}$in square aluminium strips to the exact pattern of the conductor layout. The moulds were then used to impress grooves in the cement screed to receive the conductors. In future schemes grooves will be impressed on the reinforced concrete, thereby further reducing installation cost.

With a grooved wooden roller fixed to a length of conduit, the conductors were rolled quickly and effectively into grooves formed the previous day. The action of rolling the conductor in imparted an upward curve which served to retain the conductor rigidly in the straight section of the grooves when the curved ends were weighted down.

All junctions in the 1,250ft average phase length of the conductor are silver-soldered butt-joints. A brass sleeve encloses each through-joint, the interspace being filled with alumina paste and dried out in a blowlamp flame. The sleeve is silver-soldered to the conductor sheath. Energy supply points and star-pointed terminal ends are enclosed in bronze boxes. These boxes were produced at a local foundry, a standard 6in by 3in cast iron box, filed smooth, being used as a mould. Corrosion is thereby avoided. The star-point of each circuit is at present insulated but provision is made for earthing should it be found desirable.

With an 11 kV substation on the site, the switching of 210 kW of heating load presented no problem beyond the capital cost of a circuit breaker. It was, however, desired to explore a method of control which could be used in densely loaded residential neighbourhoods without causing annoyance to other customers. Hence, the use of 21 kW circuits, which confirmed that it is cheaper to control a number of small loads than one big one.

The heating circuits are brought back to a Berry's Electric switchboard designed especially for the complete

* West Kent District Manager, South Eastern Electricity Board.

installation. The energy used in floor warming is metered separately. Primary control of each circuit is by means of a h.r.c. fuse-switch. Automatic operation through the initiation of thermostatic control is provided by 30 A three-phase Rheostatic type RA3 contactors. Five circuits in the stores proper operate as one bank in cascade sequence, and the three circuits in the garage similarly. Delayed action between each step in each bank is secured effectively and very cheaply by incorporating in the second and each subsequent closing-coil circuit a Brimistor (inverse characteristic resistance) costing half a crown. The delays vary between 2 and 5 sec. The remaining two circuits, in the office accommodation, operate independently under simple air thermostat control.

The capital cost of the installation has proved to be very low. The work was carried out by direct labour and taking into account the cost of the special moulds for the cable grooves, and the formation of the grooves to receive the cable, the average cost per kW has been found to be a little less than £7.

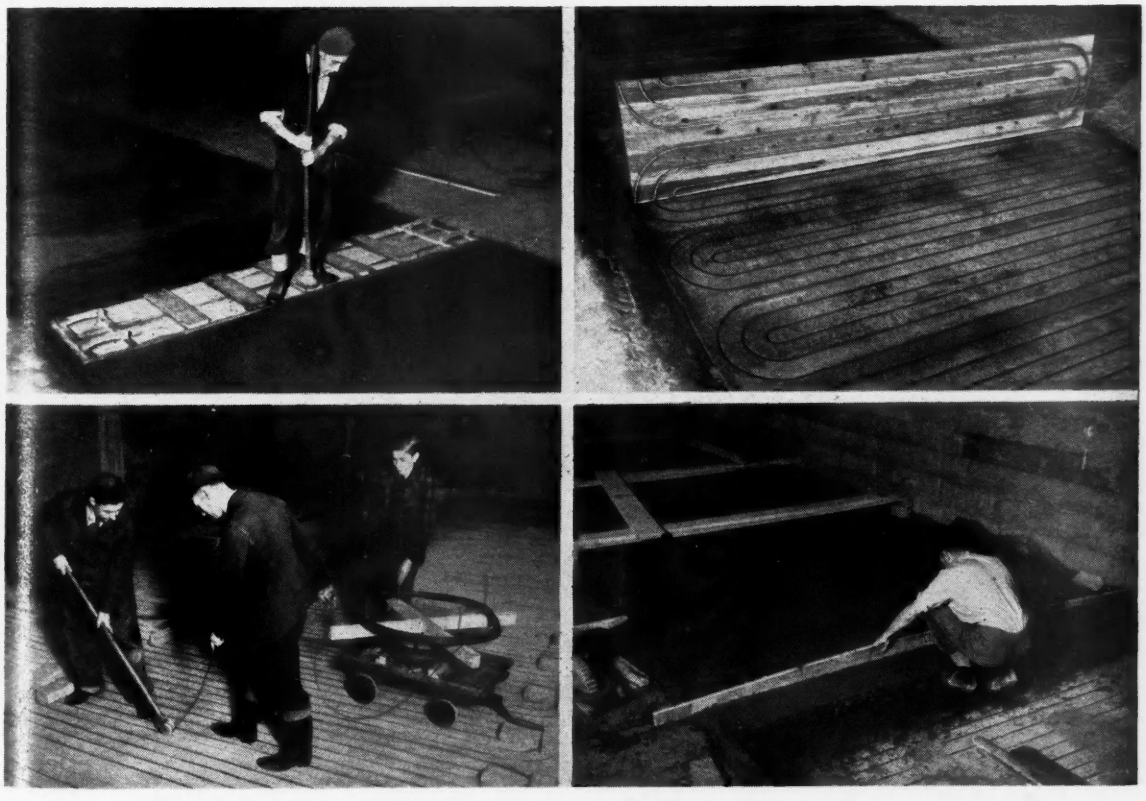
Since there is still much to be learned about electric floor warming, three systems of automatic operation are provided for use at will. The stores and garage banks are controlled by air thermostats, which, in turn, are governed by a Rheostatic compensating device on the north wall of the building. This device responds to rapid changes in ambient temperature and accelerates the operation of the thermostats. The object is to guard against a rapid loss of building warmth brought about by a lag in heat input. A floor thermostat is also incorporated to prevent excessive floor temperature being caused by mal-operation of the air thermostat. Secondary switching is provided to test the effectiveness of control by floor thermostats only.

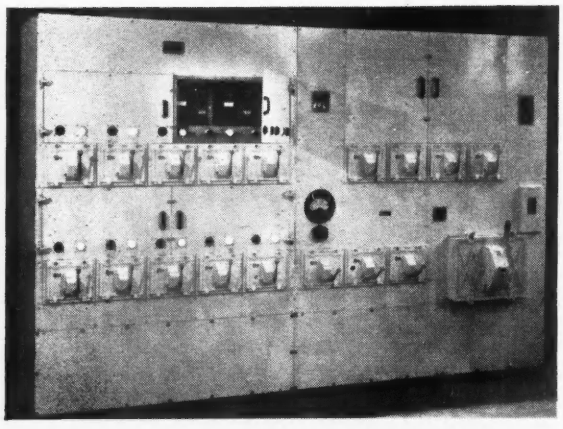
A third and relatively inexpensive control consists of a Rheostatic QR thermostat in the stores and a QA thermostat on the north wall. The QR contacts, in response to the room temperature, close when the pre-set upper limit is reached and through circuit wiring energize a heating coil in the QA thermostat. The resultant heat tends to open the QA contacts against the closing effect of the ambient temperature. Whichever effect is greater determines whether heat is switched on or not. It is believed that the use of this system in Eire has secured a saving of as much as 33⅓ per cent in energy costs.

When calculating heat losses it was accepted that whilst conventional heating methods are subject to a downward heat loss to the subsoil, with floor warming it must be greater. Whilst this extra loss could be reduced by the incorporation of thermal insulation beneath the conductors, such a course would have eliminated an opportunity to explore the possibility of thermal storage and off-peak operation. Accordingly, no downward or base insulation is used. On the other hand, edgewise heat loss is a much greater factor in the annual cost of floor warming and serves no useful purpose. Edgewise thermal insulation is installed round the inner perimeter of the heated area. This comprises a 2in thick belt of standard " Onazote," starting at a normal depth of 2in and extending vertically downwards to a depth of 2ft 2in. To facilitate research into the value of the edgewise losses, a " control " gap of 6ft is left at a suitable point.

A comprehensive system of instrumentation is installed to register the operation of the heating system. A Leeds & Northrup 16-point temperature recorder supplied by Messrs. Integra is erected in the mains storage area. This records the temperatures measured by resistance thermometers installed at sixteen points:—Floor tempera-

Installation of the heating cable: Applying the mould to the ⅜in wet concrete; construction of the mould; inserting cable into grooves by a wooden roller wheel; covering cable with final layer of concrete screed





Specially-constructed switchboard containing all switchgear, contactors and meters

ture—stores (as near as practicable to the surface); the earth temperature at 6in intervals from 1ft to 4ft 6in deep; the air temperatures in the stores and garages; the floor temperature in the garages; the ambient temperature; the temperature on inner face of the edgewise insulation; the temperature in outside ground immediately opposite to this; and the earth temperature in outside ground at "control" point in position similar to the last-named.

In addition, a series system of six thermo-couples is wrapped around a section of the final floor screeding. The e.m.f. generated by these thermo-couples will be logged by a Foster recording pyrometer. When related to the thermal conductivity of the floor screed, an accurate measurement should be obtained of the actual heat radiation from the floor to air. Plans have been made to measure the temperature gradient in the air from floor to ceiling.

It is as yet too soon to give the results obtained. It can be recorded, however, that as an emergency measure to enable the interior decorators to carry on with their work, the heating circuits in the stores were energized during the very cold spell at the end of January. At the moment of switching on, the floor temperature was 22 deg F. Very quickly warmth was established in the building and with a floor temperature of 74 deg F workmen engaged at normal working plane much appreciated the comfortable conditions. There is a noteworthy absence of convection air currents. A man working 10ft above floor level fixing lighting fittings was less comfortable, and said so. This is significant evidence that the heat is where it is needed, and suggests that the overall heat losses may be less than usual.

Another technical feature is the adoption of the earthed concentric system of wiring for the lighting installation; Pyrotenax cables have been used. The main lighting throughout is by 80 W fluorescent tubes. Fittings in the stores and garage are suspended from the barrel arch roof. Circuit wiring was laid on top of the reinforced concrete roof to accurately placed pre-formed entry holes at the lighting points. These circuits were subsequently concealed and protected from the elements by a 2½in layer of exfoliated vermiculite insulation and a final double layer of bituminous roofing felt. Substantial economy in wiring costs has been secured by the use of ceiling switches, thereby eliminating expensive switch drops. In each fitters' workshop there is a 25 V circuit for handlamps and a 110 V circuit, with earthed centre point, is provided for portable tools. Fixed lighting in the vehicle inspection pit is by G.E.C. 40 W flameproof fluorescent fittings.

Exterior site lighting is by G.E.C. "Duoflux" reflectors incorporating 750 W m.f. lamps. The supporting columns for the reflectors are of Northern Aluminium standard 4in dia duralumin tubing chosen because of a desire to investigate the use of aluminium for such purposes. They were erected by two men, whereas a crew and equipment would have been needed to erect reinforced concrete columns.

Thanks are due to the South Eastern Electricity Board for permission to publish this information and the illustrations.

Mistaken London Transport Decision

IN the course of comments on the decision of London Transport to supersede its trolley-buses by oil-driven buses, the British Electrical and Allied Manufacturers' Association says that this decision may well lead to higher fares. Trolley-buses, with their high potential carrying capacity, are able to move the maximum number of people along well-defined routes in the shortest possible time. Their high acceleration, lack of vibration and good braking qualities allow them to keep more efficient schedules.

The average life of a trolley-bus is approximately 20 years, whereas that of an oil-driven bus is considerably less than 10 years. In three years' time, London's 1,800 70-seat trolley-buses will have to be replaced by 2,000 64-seat diesel-engined buses to carry the same amount of traffic.

The modern diesel-engined bus costs approximately £6,000, and therefore the London Transport Executive will need a further £12 million to purchase this new transport fleet and this will inevitably mean higher fares. The pre-war trolley-bus installation cost considerably less than £12 million. In fact, many of the vehicles are only 10 years old and do not need replacing for a further 10 years. Many others are 20 years old and need overhaul and new bodies, which will cost £2,500 each, compared with £6,000 for a new diesel-engined bus.

By adding a further 200 vehicles to their fleet, the London Transport Executive is going to add to the already considerable traffic congestion in London's streets. It is also ignoring the trolley-bus's contribution to the national economy by making use of home-produced electricity, which improves the load factor of power stations to the benefit of all electricity consumers. Oil-driven engines are dependent on fuels supplied from overseas, which are subject to factors outside this country's control. While electric trolley-buses have a quiet, smooth and fumeless operation, diesel-engined buses discharge sulphur dioxide into the streets, which is detrimental to public health.

The B.E.A.M.A. does not hold the view that trolley-buses have an unrivalled advantage in all circumstances, but it feels that transportation of any kind should be best judged on its efficiency for a particular job and its service to the general public. London's trolley-buses, viewed in this light, have more than played their part in London's transport problems in the past. In the interest of the public it considers that the decision to replace them is one which can only lead to an increase in fares, greater congestion on the roads and a reduction in efficiency.

VIEWS on the NEWS

By REFLECTOR

IT is not long ago since I welcomed the entry of Mr. Gerald Nabarro as a champion of electricity; before that time he always seemed to incline the other way. On that occasion he put the case for the electrification of railways as well as any electric traction man. Now he has come out strongly, in a letter to *The Times*, in favour of the retention of London's trolley-buses in the face of London Transport's decision to replace them by diesel-engined buses. The matter is properly one that can be raised in Parliament and if the responsible Ministers (Fuel and Power, Transport and Health) step in they can hardly be accused of interfering with the "day-by-day" operations of a nationalized undertaking. Such a doubtful decision as that of London Transport is one of national concern as Mr. Nabarro showed in his letter and Mr. Morris in his article in last week's *Electrical Review*.

* * *

In spite of the recent decision to get rid of it, London Transport appears to be proud of its trolley-bus fleet. It boasts in the April number of *London Transport Magazine* that this fleet of nearly 1,800 vehicles is by far the largest in the world—more than twice the size of its nearest rival, the Chicago fleet of 711 vehicles. Not only that, it is also a leader in operation; for instance, London's trolley-buses have the lowest proportion of dewirements on any system in this country. There are special arrangements for watching the causes of dewirements and removing them. It is said that the tower wagon crews, who operate from eight points in the system, are responsible for 500 miles of double-track wire—"sufficient to run from London to Northern Italy, if stretched out in a straight line." Why Northern Italy I wonder? Milan has a trolley-bus system; is there some suggestion of linking up with it and disposing of London's trolley-buses in this way?

* * *

Last week's *Electrical Review* contained a leaderette commenting upon Dunfermline Council's decision to give its electrical work to its Baths Electrical Department instead of advertising for tenders. This was considered to be an undesirable practice as independent offers enabled the public to judge whether it was receiving value for its money. But advertising for tenders can apparently be carried to extremes. In the *Manchester Guardian* last week I saw an advertisement by the City of Salford inviting tenders for the supply and delivery of one refrigerator, one washing machine and one vacuum cleaner, the make being specified in each case. As each of these has a recognized list price, the object of advertising was not clear; the Town Clerk could have got them from the nearest electrical retailer. The Council could hardly have expected quantity terms.

* * *

No doubt from the electricity supply authority's point of view the prepayment meter is a rather more troublesome accounting instrument than the "quarterly" type. Nevertheless for a substantial proportion of consumers it is a means of painless payment which even the half-crown stamp system introduced by the North Western Electricity Board cannot replace. The subject has been raised by the North Western Electricity Consultative Council which has told the Board that customers are being lost to the gas industry which does not hesitate to supply slot meters. It is alleged that on this score 23 out of 26 women on a housing estate recently chose gas cookers; the relative merits of gas and electricity appeared to be a secondary consideration. It is the practice of the Board to supply prepayment meters "only if hardship grounds can be proved," according to a report in the *Liverpool Evening Express*. The argument that the meters are more expensive than the ordinary types can be met by a simple adjustment to cover the extra cost. But this, of course, creates the anomalous situation in which the (presumably) poorer consumers pay more for their electricity. It is a nice problem.

* * *

During the war and just afterwards, round about October and May the Ministry of Fuel and Power made a modern Canute of the Minister by persuading him that he could control the elements. In other words, that he could order restrictions on heating and "get away with it." Each time the climate let him down and he was forced to relax the orders. Eventually the Ministry gave up the idea that it and not the temperature was the real master but the same idea appears to have been adopted at Plymouth. There the Hospitals Management Committee recently decreed that as from 1st May the use of all gas and electric fires was to cease and the issue of coal for open fires was to be suspended. Once again Nature stepped in and, without their fires, the hospital nursing staffs began to freeze and were unable to do their work. (What happened to the patients is not recorded by the *Western Evening Herald* from which I derive my information.) Consequently the Management Committee had to admit that its order was unenforceable. The chairman said that fires *could* be used when it was cold and "in fact they are at present operating in all hospitals."

* * *

Eighty years ago, in the *Electrical Review* of 15th May, 1874, there appeared an advertisement of the London Spectroscope Company, scientific instrument manufacturers, which is so redolent of the mid-Victorian era as to be worth quoting, at least as far as the first paragraph:—

> "The above company beg to intimate to the scientific world that they have, at a great expense, secured the valuable services of Mr. Charles Owen, and have appointed him their sole and exclusive Manager. Having placed at his command abundant capital, together with extensive and commodious premises replete with all the latest improvements and appliances appertaining to the trade, they are now prepared to receive orders and execute them with the utmost promptitude and despatch."

Later it is mentioned that this Mr. Owen was the "Sole Inventor and Patentee of Owen's New and Improved System of Electrical Inter-communication between Passenger and Guard, Guard and Guard, and Guard and Driver."

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Mr. V. J. Faulkner, publicity manager of Crompton Parkinson, Ltd., has been elected chairman of the B.E.A.M.A. Publicity Committee in succession to Mr. C. H. Chaplain, publicity manager, British Thomson-Houston Co., Ltd. **Mr. C. H. Alsop,** publicity manager, W. H. Allen, Sons & Co., Ltd., has been elected vice-chairman. Mr. Faulkner has been publicity manager of Crompton Parkinson for 17 years. He is a member of the I.S.B.A. Media, Vigilance and Exhibitions Committees, and is chairman of the E.L.M.A. Lighting Service Bureau Publicity Committee. Mr. Alsop has been with W. H. Allen, Sons & Co., Ltd., since 1931, after completing his apprenticeship and works training with B.T.H. at Rugby. He is a member of the Publicity Committee of the British Engineers' Association.

Mr. A. D. Monk has been appointed manager of the Manchester depot of the Simplex Electric Co., Ltd., following the resignation of **Mr. F. N. Pardow.** Mr. Monk was previously manager of the Simplex Leicester depot and he is being succeeded in this appointment by **Mr. B. Perrott.** Mr. Monk joined the company in 1938 and, apart from war service with the Royal Artillery, he has spent his time in the East Midlands. Mr. Perrott joined the company in 1947 and has been sales engineer in the North Midlands area.

A further appointment announced by Simplex is that of **Mr. H. Mann** as "Creda" sales engineer to the North Western Electricity Board. After service with the Royal Air Force during the war, Mr. Mann joined the Lancashire Electric Power Co. and subsequently served with the North Western Electricity Board. He will be working with Mr. W. D. Clegg, who was recently appointed "Creda" sales engineer to the N.W.E.B.

Mr. J. Savage, A.M.I.E.E., manager of the Hastings District, South Eastern Electricity Board, retired on 31st March. Mr. Savage received his general education at Heywood and Middleton and his technical education at Farnworth and Bolton Technical Schools, and at the Royal Technical College, Glasgow. He was trained with Dobson & Barlow, Ltd., Bolton, and Farnworth U.D.C. Electricity Department. He was charge engineer at Farnworth from 1912 to 1915 and from 1915 to 1921 he occupied the positions of charge engineer, mains engineer and power station superintendent with Paisley Corporation. He was appointed power station superintendent at St. Helens in 1921 and later he was principal assistant there until 1927 when he was appointed deputy borough electrical engineer of Hastings, becoming borough electrical engineer and manager in 1945. Mr. Savage became Hastings District manager under the South Eastern Electricity Board in 1948. He has served on the District Committees of the E.I.B.A. and E.D.A.

The Department of Atomic Energy has announced that **Mr. Basil F. J. Schonland,** C.B.E., F.R.S., M.A., Ph.D., M. (S.A.) I.E.E., who is at present head of the Bernard Price Institute of Geophysical Research in the University of Witwatersrand, is to be appointed Deputy Director of the Atomic Energy Research Establishment at Harwell. The appointment will take effect towards the end of this year.

Dr. B. F. J. Schonland

Dr. Schonland, who is fifty-eight, was educated at St. Andrew's College and Rhodes College, Grahamstown, South Africa, and Gonville and Caius College, Cambridge. From 1915 to 1918 he served with the B.E.F., France, with the rank of captain R.E. (Signals). Whilst at Cambridge he was engaged on research work in the Cavendish Laboratory. From 1922 to 1936 he was lecturer and later Professor of Physics at the University of Cape Town; in 1937 he was a Halley lecturer at the University of Oxford. From 1941 to 1944 he was brigadier, South African Corps of Signals, Superintendent, Army Operational Research Group (Ministry of Supply), and brigadier (scientific adviser) to C.-in-C. 21st Army Group, British Liberation Army. He was president of the South African Council for Scientific and Industrial Research from 1945 to 1950.

Mr. E. J. Parton, B.Sc., Ph.D., lecturer in electrical engineering in the University of Glasgow, is to be Professor of Electrical Engineering in the University of Nottingham in succession to Prof. H. Cotton, who is retiring at the end of this session.

Mr. G. Pool, erecting shop superintendent with C. A. Parsons & Co., Ltd., is leaving England on 18th May for Australia, to take charge of a new company being started by Parsons under the style of C. A. Parsons (Australia), Ltd. Mr. Pool received his technical education at Rutherford College, Newcastle-on-Tyne. He joined Parsons as an apprentice, and later became foreman in charge of gun production, technical assistant to the works manager and eventually erecting shop superintendent.

Mr. C. F. Barnard has been appointed joint managing director of Associated British Oil Engines (Marine), Ltd., with **Mr. J. Jones.** Mr. Barnard has been managing director of Mirrlees, Bickerton & Day, Ltd., since October, 1953, a position which he retains. Mr. Jones is also managing director of the National Gas & Oil Engine Co., Ltd.

An appeal on behalf of the Royal Commercial Travellers' Schools for the Maintenance and Rebuilding Funds will be made by the **Hon. Mrs. Leslie Gamage** (member of the Board of Management) on Sunday next, at 8.25 p.m., in the B.B.C. Home Service programme.

Mr. H. C. Towers, M.I.E.E., M.I.R.S.E., M.Inst.T., is reported by the "Indian Electrical Contractor" to have proceeded on leave recently before his retirement from the position of chief signal and telecommunication engineer of the Western Railway (India). Mr. Towers has been in Indian railway signal work since 1926, first with the Bombay, Baroda and Central India Railway; he became chief signal engineer of the Western Railway when it was formed in 1951. Mr. Towers has contributed a number of articles on railway signals to the "Electrical Review."

Mr. F. N. Lloyd, chairman and managing director of F. H. Lloyd & Co., Ltd., was elected chairman of the British Steel Founders' Association at its annual meeting in London on 4th May. He has for the past two years been vice-chairman of the Association and he has also been a member of the Executive Council from the foundation of the Association.

A presentation was made by members of the Association to the retiring chairman, **Mr. T. H. Summerson.** The presentation took the form of two landscapes by G. F. Watts and E. J. Niemann. Mr. Summerson was also handed an illuminated address acknowledging the services that he had rendered to the Association during his period of office.

Mr. G. Boex will be retiring from the position of joint managing director of the British Aluminium Co., Ltd., on

4th July next when he will reach the retiring age. He will be succeeded by Mr. **W. J. Thomas.** Mr. Boex will remain a director of the company and has agreed to carry out any special work as a consultant which the board may ask him to undertake from time to time.

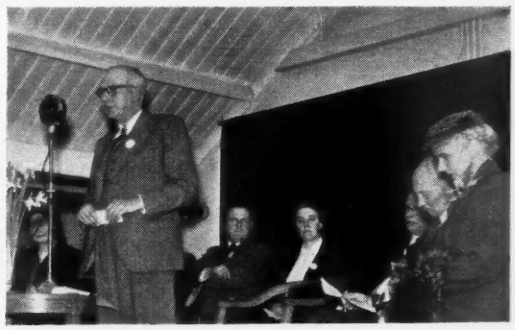
Mr. A. Gemm, A.M.Inst.F., deputy superintendent at Carlisle power station, North West, Merseyside and N. Wales Division, B.E.A., has been appointed superintendent at this station; he succeeds **Mr. R. Wright,** A.M.I.E.E., M.Inst.F., who will retire at the end of this month after over forty years in the electricity supply industry, commencing with the Carlisle Corporation Electricity Department in 1907. Mr. Gemm, who became deputy superintendent in October, 1953, has spent nearly all his working life in the industry and has been at the Carlisle station since 1935.

Mr. C. E. Hay has been appointed by Communication Systems, Ltd., to fill the newly established post of technical director. Mr. Hay has been transferred to Communication Systems, Ltd., from its parent organization, the Automatic Telephone & Electric Co., Ltd., which he joined in 1945 from the Ministry of Aircraft Production. Mr. Hay has had wide experience with the Export Department of the Automatic Telephone & Electric Co., Ltd., and has acted as Scandinavian representative and latterly as managing director of the Automatic Telephone & Electric Co. (India), Ltd.

Mr. H. L. Reynolds has been appointed Southern Counties district manager by W. T. Glover & Co., Ltd. He was previously district engineer in the No. 1 Sub-Area of the Southern Electricity Board. He served his apprenticeship with the Mid-Cheshire Electricity Supply Co., Ltd., and has held various appointments in the supply industry, notably in the Yorkshire area.

Mr. H. L. Reynolds

On 1st May "Parents' Day" was held at the Rugby Works of the **British Thomson-Houston Co., Ltd.,** when nearly 250 parents, of apprentices in their first year of training at the Rugby Works, accepted the invitation of the company to see something of the facilities afforded to their sons and daughters during their training for future careers in the electrical engineering industry. The principal guest—himself an ex-B.T.H. apprentice and engineer—was Sir Hamish MacLaren, Director of Electrical Engineering, Admiralty,



Mr. L. J. Davies (director of research and education, B.T.H.) speaking at the annual "Parents' Day" at Rugby.

who addressed the parents and other visitors during the afternoon. In the morning, the guests visited the Rugby College of Technology and Arts, the Laurels Apprentices' Association Club and the Firs Social Club. In the afternoon, there were conducted tours of the Rugby Works, including visits to the various Apprentice Training Departments, before adjourning to the main apprentice residence, Coton House, where tea was provided. This was followed by an assembly in the dining room at Coton House for an official welcome by Mr. H. L. Satchell (director manager, B.T.H. Rugby Works), who introduced the speakers —the Mayor of Rugby, Councillor F. J. Press, Sir Hamish MacLaren, Mr. L. J. Davies (director of research and education, B.T.H.) and Miss D. S. Hodson (staff lady supervisor, B.T.H.). Lady MacLaren then presented certificates to six of the apprentices who had completed their course of training during the year and had shown outstanding merit. The proceedings concluded with a display of fire-fighting by Coton House Fire Brigade.

Mr. Leo Falk, formerly chief designer and then acting in a consultative capacity to Transformers (Watford), Ltd., has retired, having served with the company since its inception fifteen years ago. Born in Germany in 1875, Mr. Falk graduated from the Polytechnikum, Munich, in electrical engineering. After seven years with Brown Boveri & Co., Switzerland, he joined the Westinghouse Electric & Manufacturing Co., Pittsburg, Pa. His next position was as chief engineer to the Maffei-Schwartzkopff Werke, and he devoted his attention to the pioneer work of developing high-speed generators, turbo-alternators and turbo-dynamos and high-speed motors. In 1925 he joined the A.E.G. in Berlin as a transformer designer engaged on high-voltage furnace transformers, rectifier transformers, and in 1938 was appointed chief designer to Transformers (Watford), Ltd. (then Transformers & Welders, Ltd.). Mr. Falk has designed some of the largest arc furnace transformers in use to-day and has played a major part in the development of the constant current regulator used for airfield lighting.

Mr. A. E. Norris, sales director of J. G. Statter & Co., Ltd., is leaving England by air on 18th May on an extensive tour of the United States and Canada.

Mr. J. O. Wilson has joined the Edison Swan Electric Co., Ltd., as representative to Southampton District Office. Mr. Wilson was formerly representative attached to the domestic appliance division of the English Electric Co., Ltd.

Mr. V. A. Bagnall retired from the position of representative in the Birmingham District Office area of the Edison Swan Electric Co., Ltd., on 9th April. Mr. Bagnall had been with Ediswan since 1929. He has been presented with a desk set by the staff, the presentation being made by Mr. A. H. Adey, manager of the Birmingham District Office.

Mr. H. C. Van de Velde, deputy to the managing director of the Marconi International Marine Communication Co., Ltd., was elected president of the Comité International Radio-Maritime for the eighth year in succession at its annual general meeting in Brussels at the end of April.

Mr. W. E. Babb, secretary of the Association of Manufacturers of Electric Wiring Accessories, and of other B.E.A.M.A. associations, who is also secretary of the recently-formed Electrical Industries Club, was married on Saturday last at St. George's Church, Bloomsbury, to Mrs. Dorothy Massingham. They were favoured with glorious weather, and after the wedding a reception was held at the White Hall Hotel. Amongst the guests were Mr. E. J. Davies (chairman, A.M.E.W.A.), Mr. A. B. Wildsmith (director, E.W.F.) and Mr. Felix A. Rogers (director, E.L.F.A.) and their wives.

Mr. T. Dunwoody announces that he has now commenced private practice as a consulting engineer at 1, Hanover Square, W.1 (telephone: Mayfair 1101). He had been previously consulting electrical engineer to T. P. Bennett & Son, architects.

Mr. G. Davidson, M.I.E.E., has been appointed electrical engineer with T. P. Bennett & Son, in

succession to Mr. Dunwoody. Mr. Davidson was engaged for many years in electrical contracting until he joined Kennedy & Donkin, consulting engineers, as assistant engineer in 1942. He has been technical officer and assistant general secretary of the Association of Supervising Electrical Engineers since 1948, and was also technical editor of "The Electrical Supervisor" during that time.

Mr. J. E. Sutton has been appointed senior lamp and lighting salesman at the Newcastle-upon-Tyne office of the British Thomson-Houston Co., Ltd. Mr. Sutton has been with the company at Manchester since 1937. He served in the R.A.F. from 1941 to 1945. He succeeds the late Mr. J. K. McCraith.

Mr. J. J. Gowen, A.M.I.E.E., who recently retired after twenty-five years' service with the Electricity Supply Board of Eire, has been presented with a silver tray and a decanter set of cut glass by the staff at Kilbarry, Co. Cork.

At last Tuesday's monthly luncheon of the **Electrical Industries Club,** Sir Norman Kipping, director-general of the Federation of British Industries, was the speaker. He dealt with possible future trends in industry and the lines on which education and recruitment for industry might proceed. The next luncheon is on 8th June at the Connaught Rooms, London, W.C.2.

The N.W. (Manchester) Area qualifying competition of the **Electrical Industries Benevolent Association** National Golf Competition was held on the course of the Davyhulme Park Golf Club on 4th May. Cards were taken out by 112 competitors and a number of non-playing friends gave their support to the meeting. The golf prizes were presented by Switchgear & Cowans, Ltd., B.T.H. Co., Ltd., Ferranti, Ltd., G. H. Scholes, Ltd., Hotpoint Electric Appliance Co., Ltd., Dorman & Smith, Ltd., and Mr. J. F. Epps. Other prizes were presented by Claude-General (Neon Lights), Ltd., Mr. G. C. Cooper (Altrincham), W. T. Glover & Co., Ltd., and Mr. J. B. Hartley, and numerous smaller gifts were received for a "Tombola." The prizewinners were as follows:—"Ferranti" Trophy: Mr. E. Stonehill; runners-up (Div. I), Mr. L. S. W. Turner; (Div. II), Mr. T. Ogden. Best gross: Mr. A. O. Ahlquist. Veterans: Mr. G. Smallman. Visitors: Mr. H. Allen. Putting: shared by Messrs. T. H. Garner and R. Thorpe. The day's effort resulted in a sum of £150 being raised for the E.I.B.A. funds.

The Midlands Area golf competition in connection with the **Electrical Industries Benevolent Association** has been arranged to take place on Wednesday, 21st July, at the Edgbaston Golf Club, Birmingham, and will be followed by a dinner. This will be an open tournament and application forms are obtainable from the area secretary, Mr. G. Redmond, 99/100, Charlotte Street, Birmingham, 3.

The directors of **Drake & Gorham, Ltd.,** gave a dinner to the directors and senior members of the staff of their subsidiary companies at Kettner's Restaurant, London, on 4th May, at which Mr. R. H. M. Drake (chairman) presided. During the evening a presentation of a gold wrist watch was made to Mr. H. Brown to mark his completion of 50 years' service with the contracting subsidiary. Sixteen members of the staff have completed 50 years' service with the company.

OBITUARY

Mr. J. W. Treece.—Mr. John William Treece, who died at his Birmingham home last week at the age of sixty-six, was appointed managing director of Electricars, Ltd., upon its foundation after the first world war. When that company was acquired by Crompton Parkinson, Ltd., in 1939 Mr. Treece became a consultant to the Ministry of Supply in establishing aircraft factories. He was subsequently consultant to the Brush Electrical Engineering Co. In recent years he founded, with his son, Mr. Lewis Treece, Electrical Vehicle Services, Ltd. He remained managing director of this firm and of Treece (Birmingham), Ltd.

Parliamentary Report

THE Television Bill has made such slow progress in Committee that the Government, in spite of Opposition protests, has brought in a time-table motion to expedite the proceedings.

During consideration of Clause 1 Mr. Mitchison moved an amendment to ensure that the Independent Television Authority should provide television broadcasting services within a year of the passing of the Act.

Mr. Hobson pointed out that the Assistant Postmaster-General continued to receive questions from members who had had complaints from local authorities about their ambulance services and the wavelengths which would be available to them. To accept the amendment would be to remove doubts and to allow the necessary steps to be taken for those wavelengths to be changed.

Mr. Charles Orr-Ewing said that they would achieve greater speed if they made use of the existing B.B.C. transmitter masts for this second service. There was no reason why the I.T.A. and the B.B.C. should not share capital resources and make use of the same steel and the same sites. It was much more difficult to provide national coverage on Band III and unless the transmitters were of high power reception would be indifferent.

Replying, Mr. Gammans, the Assistant Postmaster-General, said he thought that the new Authority would be on the air within one year of its being constituted, but he was not willing to be tied down by Act of Parliament; there were too many uncertain factors.

The amendment was negatived.

Electricity Supply in Borrowdale

Mr. Peart raised the question of an electricity supply for the valley of Borrowdale. He wanted the North Western Electricity Board to go ahead with this scheme of rural electrification.

Mr. Joynson-Hicks, Parliamentary Secretary to the Ministry of Fuel and Power, said that the North Western Board had not been idle in the matter of rural electricity. In 1951–52 it connected 595 farms to the main electricity supply. There was a slight improvement in 1952–53 when it connected 621 farms. In 1953–54 it connected over a thousand farms. The connections were continuing at about the same rate. The Board had now connected some 60 per cent of the farms in this area, but 22,000 farms and rural premises were still awaiting mains electricity in the area. In the Lakeland Sub-Area, in which Borrowdale was situated, the Board in 1953–54 made a record number of connections to farms—224, but in the Sub-Area no fewer than 160 schemes were waiting. It was estimated that these would cost £1½ million.

Capital expenditure was no longer a major factor in precluding the development of rural electrification. The limitations now were of a practical character. The primary limitation was that the available man-power required for planning and processing, as well as for the technical work, was all being absorbed and put to use in the area. The Board's expenditure on rural electrification would shortly reach no less than £800,000 a year.

Capital Investment in Scotland

Mr. Steele asked the Minister of Fuel and Power what had been the total new capital investment of the nationalized coal, electricity and gas industries since vesting date in each case in Scotland.

Mr. Geoffrey Lloyd said that the figures were about £27 million for the National Coal Board, £48 million for the British Electricity Authority and £14 million for the Scottish Gas Board. He was informed by the Secretary of State for Scotland that the figure for the North of Scotland Hydro-Electric Board was about £78 million.

INDUSTRY AND THE HOUSE

Atomic Energy and Television Bills

By A. M. F. PALMER, A.M.I.E.E., M.P.

TWO measures of outstanding industrial interest before Parliament, since we resumed after Easter, are the Atomic Energy Authority Bill and the Television Bill. The first has received its Third Reading and is now on the way to the Lords, but not before receiving a final blaze of publicity because of a new clause moved " unofficially " by Mr. Beswick from the Labour benches. This aimed to prevent the Authority producing a hydrogen bomb without parliamentary sanction. Although the Press interpreted the sixty-three Labour votes cast in favour of the new clause against the advice of the Party leadership as yet another aspect of rebellious upheaval in the Opposition ranks, it is sufficient here for us to note that Mr. Beswick's clause had the most respectable parentage. True it is that the clause found wide and erratic support once launched on its career, but it originated in the first place from that same group of technically minded Labour Members who have carried from the beginning the routine task of preparing Opposition amendments.

It would be an interesting point, brushed aside in the heat of the debate, to know just what part the new Atomic Energy Corporation will play in the preparation of weapons of war as distinct from organizing the industrial applications of nuclear fission—the stated primary reason for the existence of the Corporation? The whole thing being so wrapped in secrecy, of the essential kind as well as the kind which springs from red tape and force of habit, it is hard to do anything but guess. It is evident that the new Corporation will supply fissile material to industry generally, nationalized and privately owned, to hospitals for medical research and presumably to the Service Departments. Whether in fact the Corporation will complete the manufacture of atomic weapons—uranium principle, hydrogen principle or any other principle—is an open question on which the Minister was properly and discreetly silent. In any case, nobody bothered to ask him.

Television Bill Committee Stage

With obvious foreboding—there are more than 130 amendments on the Order Paper—Members addressed themselves on Tuesday evening to the Committee Stage of the Television Bill. Their fears were more than justified when after six and a half hours the House found itself still not beyond the first sub-section of the first clause. After a preliminary Labour amendment seeking to provide an appointed day for the setting up of the Independent Television Authority had been defeated, Mr. Shackleton, the Labour Member for South Preston, moved a further amendment to provide that the word " independent " should be dropped in favour of " commercial." He thought it completely wrong to use the word " independent " for he doubted whether any Authority ever set up was more completely at the mercy of the Government of the day than the proposed Authority. Under the Bill the Postmaster-General had complete power to order what should or should not be broadcast. Mr. Shackleton thought it deliberate Government policy to cover up wicked intentions by smooth words; they had shied away from the word " commercial " as if it were something indecent. In reply Sir David Maxwell Fyfe, the Home Secretary, said that the independence of the B.B.C. was a matter of pride and admiration to all. It was equally important to emphasize that the new Authority would also be independent. Another aspect of independence was that the Authority was distinct from the programme companies; it was in a special position, being the instrument by which the Government hoped to maintain reasonable safeguards for the public interest.

While Conservative Mr. Gower of Barry protested that the Opposition were raising a storm in a teacup, Labour's Mr. Chapman of Northfield calculated that something like £600 a minute would have to be raised from advertisers for the Authority to put on a programme. It was upon the great business interests, which could afford between £5,000 and £6,000 per month and who were spending already between £100,000 and £200,000 per year on advertising, that the Authority would depend. How, therefore, he asked, could it be regarded as being anything but commercial?

Authority Membership

Government majorities have been and are likely to be small in the Committee Stage, because the handful of Liberal Members are generally voting with the Opposition; however, on this particular amendment the majority was fourteen. But on a Government amendment to delete a list of qualifications for membership of the new Television Authority, leaving the choice to the discretion of the Postmaster-General, the Government majority fell to the lowest yet, a mere three. Mr. Herbert Morrison who, in spite of presumed preoccupations in other directions, is in very good form on this Bill, said bluntly he did not trust the Postmaster-General enough to give him a blank cheque. The proposed Authority was not a public service organization like the B.B.C., it would be dependent on advertising revenue. It was highly desirable, therefore, that the Postmaster-General should take account of certain set qualifications in making appointments. The Home Secretary, realizing he was in difficult waters, was anxious to assure Mr. Morrison that although the appointments appeared in the Bill as being at the discretion of the Postmaster-General, no Government would in practice leave such appointments to a single Minister; he thought the Cabinet would probably be brought in. Sir David promised careful consideration of all the various categories from which selection could be made, including the trade union movement.

Not unexpectedly perhaps, the Government now propose to impose a " time-table "—the hated guillotine—to facilitate the Committee Stage of the Bill. Next Tuesday the House will spend the entire day debating the motion to bring it in. All parties when in Government have " reluctant " recourse to the guillotine and the same parties when in Opposition denounce it with conventional indignation. On this occasion, however, the Labour Party

have a stronger case than usual as much dislike of the Television Bill is found in quarters not hedged by normal party boundaries.

Amid so many other excitements the Second Reading of the Finance Bill, following Mr. Butler's mark-time Budget, has passed almost unnoticed. Mr. Boyd-Carpenter, the Financial Secretary to the Treasury, in opening for the Government confined himself to a detailed recital of the provisions of the Bill and avoided general argument. Sir Frank Soskice, an able, but perhaps unexpected choice as Labour spokesman, was particularly interesting on the industrial investment allowance. He thought it should have been selective; it was doubtful how far it would achieve its purpose in that sector of industry which was not short of funds; conversely it was most unlikely to have any real effect in those concerns which might invest more but were inhibited by shortage of funds. On " uplift " and purchase tax the Opposition were firmly of the opinion that the minority report of the Committee which had considered the issue was the right view. Why should not the advantage of a lower priced article be passed on to the housewife?

No-one could blame the Chancellor of the Exchequer, remembering the heavy criticism his Budget has received, if when replying to the debate he reminded the House that dollar reserves were accumulating in a manner which showed the utmost confidence in sterling, production was rising and full employment had been maintained. He remarked sadly that the parliamentary Opposition and organized Labour never bothered to acknowledge these achievements. Poor Mr. Butler, politics are an ungrateful business!

SPEECH SYNTHESIS

In an informal lecture on " The Experimental Synthesis of Speech " given recently by Mr. W. Lawrence, B.A., to the Radio Section of the Institution of Electrical Engineers, the lecturer said the experimental technique demonstrated was part of a research project aimed at reducing the bandwidth required for the transmission of telephone signals. In a normal telephone system the signal was a more or less faithful copy of the acoustic waveform, but in the system proposed the signals represented instructions for making the required waveform rather than a picture of the wave itself. Only speech-like sounds could be signalled, and only those variations were reported which were significant to the listener.

Speech was described by means of parameters which specified those features of the articulation process that were acoustically significant, the description being made in terms of the acoustic state of the vocal tract, and the nature of the acoustic excitation applied to it. It was shown how the values of the parameters could be inferred from recordings of the acoustic waveform of a spoken phrase, and an experimental technique was demonstrated for remaking the sound from the values of these parameters. It was also shown how an acoustic wave could be generated which produced an auditory sensation similar to the original speech, and that variations other than those caused by the selected parameters were not significant. This synthetic speech conveyed not only the verbal message, but also many of those features that identified a speaker and revealed his mood, such as variations of vowel colour, timing, stress and intonation patterns.

In the discussion which followed it was mentioned that ordinary speech contained a considerable amount of redundant information, and that if, as appeared to be the intention, it was possible to use synthetic speech on telephone channels the reduction of speech to the six parameters referred to by the lecturer would enable communication channels for certain purposes to be used much more efficiently. The lecturer was asked what would be the effect of the introduction of distortion, which would be inevitable in long distance transmission, on synthetic signals composed solely of the six parameters necessary to reconstruct intelligible speech; if the redundant matter were removed did it make speech less readily intelligible, particularly in the presence of distortion; and how important in fact was the part of ordinary speech which had been dispensed with? In reply the lecturer said that his impression was that synthetic speech signals would stand a considerable amount of distortion. In his experience in making slides for the speech reproducing equipment he found that the introduction of considerable distortion had not greatly affected the degree of intelligibility.

A number of speakers referred to the desirability of being able to recognize voices and wondered whether the result would be the sound of a disembodied voice. It was suggested that if personality was lost in this way the information could more economically be transmitted by telegraph without appreciable loss. It seemed essential that the personality of a speaker should be retained if at all possible. The lecturer thought that reconstructed speech which contained less intonation than voice speech would be of little use and he hoped that it would be possible to produce sounds which from this point of view were as good as a normal voice, with a resultant conveyance of the personality of the speaker. It was suggested that the construction of the speech synthesizing machine lent itself to the use of transistors, but the author pointed out that the part of the machine which comprised the synthesisor was already very compact.

Advertising and British Prestige

Speaking on the subject of " Advertising and British Prestige Abroad " at the twenty-fifth annual conference of the Advertising Association at Bournemouth last week, Mr. Leslie Gamage, M.C., vice-chairman and joint managing director of the General Electric Co., Ltd., said that few people realized the grim struggle we were going to have to maintain—let alone increase—our exports. We were up against wild price competition from Germany and, to a lesser extent, from Japan. Two of the most powerful weapons in this struggle were national prestige and goodwill. Mr. Gamage said that in travelling abroad he had found " gross ignorance " of British affairs. Faulty " advertising " in the broad sense was, he considered, responsible for the erroneous ideas that had got abroad. We ourselves understood our national habit of self-depreciation and understatement, but the rest of the world accepted us at our own estimate. Trading was not a guessing game. The achievements of our men of science still led the world. We could feel proud of our country, and that pride must be reflected in all that we said and wrote; in every product that we sent overseas.

"Electrical Day" at the B.I.F.

MANY representatives of the B.E.A.M.A. and other electrical organizations were present at the Castle Bromwich Section of the British Industries Fair when the customary "Electrical Day" was held.

Speaking on behalf of the guests at an official luncheon, Mr. D. D. Walker, chairman of B.E.A.M.A., said that the British Industries Fair was sometimes maligned. The Birmingham Chamber of Commerce was operating at a disadvantage. Unlike the Hanover Fair with its new buildings, the B.I.F. was using an old aeroplane hangar; it was, however, the cheapest exhibition in Europe. He thought that the authorities had done the best possible with it. It had grown from two acres in 1920 to fifteen acres now, plus three acres outside, or sixty acres altogether including the car parks. His personal criticism was that it was a most tiring show, partly due to its large size and partly due to its lack of floor covering. The taking over of the publicity of the Birmingham Section by the new British Industries Fair, Ltd., he thought, would prove of considerable advantage.

With regard to the Electrical Section, Mr. Walker said that the number of exhibitors had been declining over the past four years. This was attributable to two main causes. Other specialist exhibitions had certain advantages for the electrical manufacturer and also the Fair could not take the place of going out to visit customers. More than most other industries, the electrical industry had adopted this practice of taking its products to its customers which was the only real way of doing business.

Mr. J. E. Belliss, chairman of the B.I.F. Reception & Hospitality Sub-Committee, said that there had been some discussion among electrical manufacturers regarding the benefit of the B.I.F.; one of the exhibitors who had had a stand since the Fair first commenced had said that he had done so much business that he regarded participation in the Fair as essential.

Snowy Mountains Project

THE new estimate of £422 million for the total Snowy Mountains scheme is much better than critics expected, and £20 million less than the estimate made by the Snowy Mountains Authority in May, 1952. Although the original 1948 estimate was £225 million, not only have costs risen, but a number of additions and improvements have been made to the original plans.

The Minister of National Development (Senator Spooner), speaking in regard to recent tenders, says that they were particularly sought in Great Britain "because of the acknowledged skill and experience of British engineers." He adds that the Snowy Mountains Authority asked the British Board of Trade to make it known to British contractors that their tenders were invited, but the Board reported to the Authority that no British tenders were being submitted. The Minister adds that "it is essential in future that Australia shall let all contracts for the scheme on a competitive, rather than on a cost-plus basis."

It is officially stated that power from the Snowy Mountains scheme will be available "in the almost immediate future." Actually there seems to be a general opinion in Australia that the scheme will benefit only future generations, but now it is announced that "secondary industries will get the benefit of 60 MW from the Guthega power house within the next six weeks or so, and they will receive another 160 MW in four or five years' time." In some 10 years it is expected that the scheme will provide 15 per cent of all the N.S.W. electricity requirements.

Ship Installation

IN the lighting of the t.s.s. *Olympia* (23,800 tons), which recently went into service for Greek Lines on the trans-atlantic run between Europe and America, a uniform design of fitting throughout the ship was the basic conception, the emphasis being on recessed circular fittings with concentric louvres at the ceiling level. Other types were similarly louvred but were made rectangular in shape. Most of the lighting fittings were manufactured by Falk, Stadelmann & Co., Ltd., to designs initiated by the decorative architect, Mr. J. P. McBride (McInnes Gardner & Partners) with the decorative contractors, Frederick Sage & Co., Ltd., Hampton & Sons, Ltd., Waring & Gillow, Ltd., and White Allom, Ltd. Some 1,200 fittings were manufactured and were fabricated from start to finish in only three months. A large number of special indirect wall brackets of bronze were also supplied to give supplementary lighting.

In the tourist class dining saloon 2,000 sq ft of continuous louvred panelling was fitted flush with the ceiling and 40 W tungsten lamps placed at 9in centres above it in specially formed recesses. The resultant effect was one of low-brightness luminous panels from which a high intensity of illumination was obtained evenly diffused and relatively shadowless. This lighting was supplemented by 42 indirect wall brackets designed in a three-tier formation with pierced star decoration. Specially designed hanging lanthorns and lantern type wall brackets are installed in the smaller public rooms.

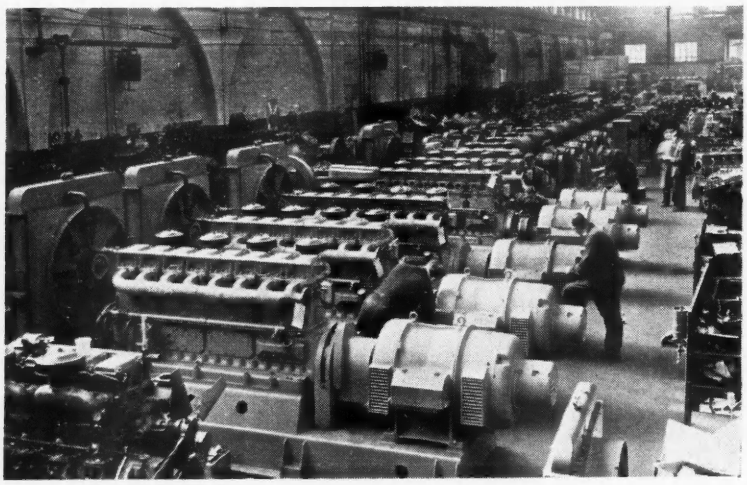
The tourist class dining room in the t.s.s. "Olympia"

INDUSTRIAL NEWS

Diesel Sets for Siam

A CONTRACT valued at more than £1,300,000 has been awarded to the Brush Group of engineering companies for the supply of a wide range of diesel generating sets for the electrification of Siam's rural areas. Initial deliveries are already under way. The Government contract for the complete power requirements of this scheme involves 239 diesel-electric generating sets.

Mirrlees, Bickerton & Day, Ltd., of Stockport, and J. & H. McLaren, Ltd., of Leeds, will produce the diesel engines and manufacture the sets, the electrical equipment being provided by the Brush Electrical Engineering Co., Ltd.



The final stages in the production of 55 and 115 kW generator sets in the factory of J. & H. McLaren, Ltd. These sets are part of a large order for Siam

Forty generating sets of from 240 kW to 1,016 kW are being supplied by Mirrlees. These are powered by engines of the "J" range running at 750 r.p.m. and the larger "K" range at 428 r.p.m. McLaren's will provide the balance of the contract by supplying 199 generating sets of from 25 kW to 115 kW powered by engines of their Petter-Fielding "FH" and McLaren "M" ranges. These generating facilities will be installed both in existing power stations and in several new stations to be built by the Siamese Government. The order was negotiated through the Brush Group agents, Loxley Rice Co. (Bangkok), Ltd.

Electricians' Strike

About 180 electricians employed at the Greenford and Kensington establishments of J. Lyons & Co., Ltd., the caterers, ceased work on Monday last, on the instructions of the Electrical Trades Union. The cause was the engagement by the company of an electrical supervisor who was not a member of the Union. The company recognizes the E.T.U. as the proper organization for its electricians, but regards supervisors, as salaried staff, as being in a different category.

Fan Prices Increased

The Fan Manufacturers' Association, Ltd., announces that, in order to meet the additional production costs resulting from the recent wage award in the engineering industry, its members have agreed to recommend a price advance of 3¾ per cent as from 12th May.

Certain manufacturers carry stocks of standard lines; prices on these will also be increased by 3¾ per cent from 5th June.

"The First Five Years"

We have already reported that Mr. J. W. Simpson, O.B.E., secretary of the British Electrical Power Convention, was producing a booklet with the above title outlining the proceedings at the Conventions held between 1949 and 1953. This is now available from the Convention office, Winsley Street, London, W.1 (price 2s).

In a foreword Lord Citrine (the first president) stresses the great achievement of the Convention in bringing together the many sections of the electrical industry with the sole purpose of stimulating the progressive development of electricity supply in the service of the community. As Lord Citrine also says, the booklet will be a convenient source of reference to the thirty-five papers which have been presented at the five Conventions.

Portraits of the past-presidents are included, together with a bibliography and a list of Council members, and this year's president, Mr. J. R. Beard, C.B.E., contributes a message commending Mr. Simpson for his work on the booklet.

New Radio Research Building

On Monday last, Dr. R. L. Smith-Rose, C.B.E., M.I.E.E., Director of Radio Research in the Department of Scientific and Industrial Research, cut the first sod on the site of a new building being erected at the Radio Research Station, Ditton Park, Slough.

St. Lawrence Seaway

A controversy which has lasted for twenty years was ended when the United States House of Representatives last week approved, by 241 votes to 158, a Bill authorizing U.S. participation with Canada in the building of the St. Lawrence Seaway and the use of federal funds for the purpose. The Bill has already been approved by the Senate but is to return there for agreement on a minor amendment. Later President Eisenhower stated that approval of the Bill was a source of tremendous personal satisfaction.

Catalogues Wanted

Mortimer, Gall & Co., Ltd., are reorganizing their library of catalogues and invite manufacturers to send current literature to 115–117, Cannon Street, London, E.C.4.

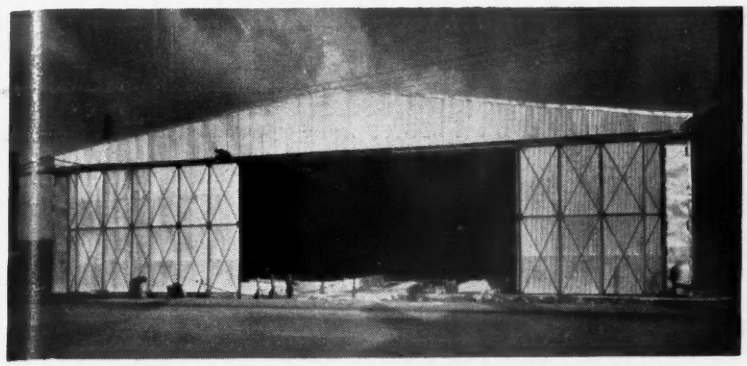
Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM Ingots	ton £156 0s 0d
COPPER, H.C. Electro	ton £244 0s 0d
Fire Refined 99·70%	ton £243 0s 0d
Fire Refined 99·50%	ton £242 0s 0d
COPPER Tubes ..	lb 2s 4¾d
Sheet	ton £303 15s 0d
H.C. wire and strip	ton £273 15s 0d
LEAD, English ..	ton £94 0s 0d
Foreign	ton £93 0s 0d
MERCURY	flask £85 0s 0d
TIN, block (English) ..	ton £716 0s 0d
ZINC, G.O.B. Foreign	ton £86 0s 0d
Electrolytic	ton £87 0s 0d
BRASS Tubes (solid drawn)	lb 1s 11¼d
Sheet	ton £249 0s 0d
Wire	lb 2s 6¾d
PHOSPHOR BRONZE Wire	lb 3s 10¼d
PLATINUM	oz £30 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 18⅜d–18¼d

Transformer Works Extension

The new extension to the transformer works of the Dennis Ferranti Co., Ltd., at Royton, near Oldham, Lancs., is nearing completion. It is



The extension of the Dennis Ferranti transformer works which is nearing completion

constructed largely from aluminium alloy, and the wide-span roof has no support other than that provided by the wall, allowing an uninterrupted floor space of approximately 30,000 sq ft. The new building is alongside the original works and is expected to be completed by midsummer. It will enable transformers up to the largest sizes and highest voltages to be built.

North London Exhibition

The annual North London Exhibition opens on Wednesday next at Alexandra Palace, London, N.22. As in previous years, the exhibits will include a wide range of domestic and labour-saving appliances. The exhibition will continue until 29th May.

Plymouth Service Centre

The South Western Electricity Board opened its new Service Centre in New George Street, Plymouth, on 7th May, with a civic ceremony and a fortnight's exhibition, which was opened to the public on the following morning. The Lord Mayor of Plymouth, Ald. Sir James Clifford Tozer, performed the opening ceremony, and speeches were made by Mr. S. F. Steward, chairman of the Board, and Mr. N. Axford, the Board's district manager in Plymouth.

Interesting features of the lighting in the Service Centre are panels spaced at intervals along the walls for the display of lighting fittings against a background of contemporary wallpapers. The main lighting comprises fluorescent lamps, with movable spot-lamps at intervals to "high-light" any special displays. As the demonstration theatre, which will seat 100 people, is separated from the Service Centre by only a glass partition with swing doors, it can easily form part of the showroom itself when not in use for demonstrations.

The title and theme of the exhibition is "Electricity in the New Plymouth." Photographic panels and models of houses and estates illustrate the progress achieved after the destruction during the war. These displays lead the visitor to a model kitchen and displays of the "Four Foundations of Modern Living" (the electric cooker, water heater, refrigerator and washing machine). Among other interesting exhibits is the Brentford "Duo-Therm" (an appliance working on the principle of the domestic heat pump, as developed by the Board's chief engineer, Mr. G. O. McLean) which provides the housewife with a cold pantry and a hot water supply from the one appliance and at greatly reduced fuel consumption.

Complementary to the exhibition, a competition is being held based on the "Four Foundations of Modern Living." The main prizes will be an electric cooker and water heater.

Balfour, Beatty in Canada

Balfour, Beatty & Co. (Canada), Ltd., the Canadian subsidiary of Balfour, Beatty & Co., Ltd., has recently taken over the business of the Toronto contractors, the Russell Construction Co., Ltd., and will continue to operate it as Russell Construction, Ltd.

Diesel-Electric Locomotive Contracts

A contract worth £4¾ million for the supply of diesel-electric locomotives to Coras Iompair Eireann (Irish State Transport) has been awarded to the Metropolitan-Vickers Electrical Co., Ltd. This contract has been secured in the face of severe competition from American and Continental manufacturers and is the largest order for diesel locomotives ever placed in Britain. It will enable the Irish State Transport to convert much of its railway system from steam to diesel traction, thus obtaining very considerable economies in fuel, maintenance and other costs. Ninety-four locomotives are to be supplied, sixty of the 1,200 h.p. six-axle type, and thirty-four of the 550 h.p. four-axle type. The electrical equipments will be manufactured by Metropolitan-Vickers at Manchester and Sheffield, the diesel engines by Crossley Brothers, Ltd., Manchester, and the mechanical parts by the Metropolitan-Cammell Carriage & Wagon Co., Ltd., Birmingham.

In the accompanying picture we show the first of forty-eight diesel-electric locomotives which the Metropolitan-Vickers Electrical Co., Ltd., has in hand for the Western Australian Government, during a trial run between Fremantle and Perth.

Commercial Travellers' Benevolent Institution

The half-yearly Court of Governors of the Commercial Travellers' Benevolent Institution will be held at the Berners Hotel, Berners Street, London, W.1, on 19th June, when all standing candidates will be recommended by the board for election without ballot for the 74th successive occasion.

"Export Selling"

The National General Export Merchants' Group, which is representative of general export merchants throughout the country, has published a booklet called "Export Selling." This is directed both to the manufacturer, who must find the most efficient and economical way of selling his goods abroad and to the overseas buyer, who wants to use the most advantageous sources of supply.

A Metropolitan-Vickers 1,105 h.p. diesel-electric locomotive—the first of forty-eight for the Western Australian Government Railways—during a trial run between Fremantle and Perth

The National General Export Merchants' Group, which consists of the Export Groups of the Birmingham, Glasgow, Liverpool, London and Manchester Chambers of Commerce, was formed in 1940 at the suggestion of the Board of Trade with the object of stimulating Britain's exports. Further information about the booklet may be obtained from any of these constituent groups or from the National Group's offices at 69, Cannon Street, London, E.C.4.

Exporting to Canada

For those exporters interested in the Canadian market, a revised edition of "Exporting to Canada" is now available from H.M. Stationery Office (price 3s, by post 3s 2½d). This booklet, which follows the same lines as the edition published in 1951, has been brought up-to-date and extensively rewritten. It contains chapters dealing with the characteristics of the Canadian market, initial steps to be taken in examining the market, selling and distribution, conduct of business, standards and specifications, sales promotion, Canadian Government regulations, and guarantees against export losses.

Calendar

The 1954–55 calendar of the Metropolitan-Vickers Electrical Co., Ltd., continues the series of "girl" calendars, this year's subject making an attractive picture.

Reconstructed Jersey Showrooms

The Jersey Electricity Co., Ltd., has recently carried out extensive alterations to its showrooms at St. Helier, and has completely re-built its demonstration room, which has been equipped for demonstrating every kind of electrical appliance. Mr. W. K. Allen, managing director, informs us that the company's electric cooker campaign has resulted in greatly increased sales. The demonstration kitchen is shown n the accompanying picture.

Rural Electrification

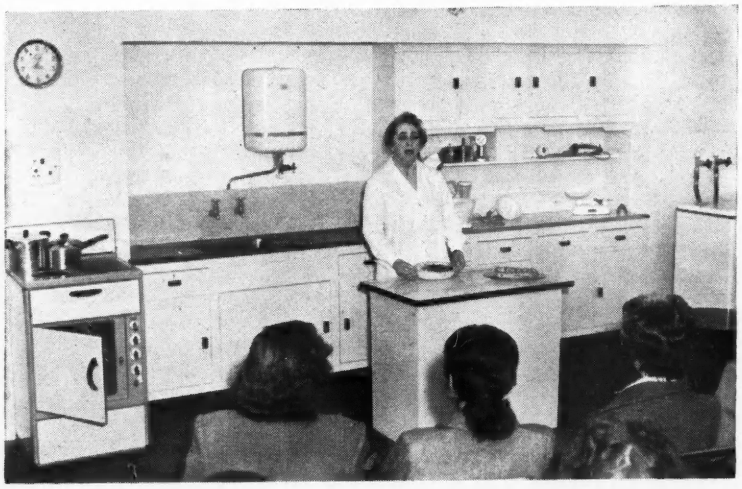
The policy and plans of the British Electricity Authority and of the Area Electricity Boards on rural electrification are set out in a booklet bearing this title. The booklet states that over the next ten years the electricity supply industry plans to spend £130 million to provide a further 105,000 farms with an electricity supply, so that by 1963 approximately 85 per cent of the farms in the areas served by the Boards will have electricity. It explains why the proximity of distribution lines to a farm does not necessarily imply that a cheap direct supply can be given. Figures illustrate the progress made in rural electrification since vesting date and details of the advice and help which are available from the Area Boards, E.D.A., and E.R.A. are given.

Works Visit

Some twenty-eight electrical engineers from various steel works and other industrial organizations in and around Sheffield were conducted on 4th May by Mr. H. Riley, electrical wholesaler and Simplex agent in Sheffield, on a tour of inspection of the works and foundry at Broadwell, Oldbury, Birmingham, of the Simplex Electric Co., Ltd., where they inspected the latest developments in the manufacture of switch and fusegear, conduit and fittings, flameproof equipment, and accessories.

The "Home Grown" Greenhouse

The Electricity Stand at this year's Chelsea Flower Show, which will be held from 26th to 28th May, will be linked up with the B.B.C. "Home Grown" programme. The exhibit will reproduce the amateur greenhouse with all its electrical installations which has been given prominence in the B.B.C. Sunday afternoon gardening feature. This includes thermostatically controlled tubular heating. A special feature will be the "covered bench" or "greenhouse within a greenhouse" across one end of the house. This will contain a thermostatically controlled air heating cable and a hand operated soil warming cable bedded in sand and covered with peat.



Demonstration kitchen at the St. Helier showrooms of the Jersey Electricity Co.

Trade Announcements

The address of the new premises at Sheffield of **W. Canning & Co., Ltd.**, is 1, South Parade, Shalesmoor, Sheffield, 3 (telephone: Sheffield 24101).

Edward Wilcox & Co., Ltd., Manchester, has opened a new London office at Fulwood House, Fulwood Place, Holborn, W.1 (telephone: Chancery 2206). The company emphasizes that the new office is under its name, and there is now no connection with the agency which previously operated on its behalf.

The registered offices of **Associated British Engineering, Ltd.**, are now at 9–10, Cavendish Square, London, W.1 (telephone: Langham 8351–3). The London sales office of the following companies of the Group will also be at this address:—The Bergius Co., Ltd., Henry Meadows, Ltd., H. Widdop & Co., Ltd., and A. C. Morrison (Engineers), Ltd.

The London office of the **Parsons Engineering Co., Ltd.**, is also at 9–10, Cavendish Square, W.1 (telephone: Langham 8351–3).

The **Clare Instrument Co.** has opened a London office at 39, Victoria Street, S.W.1 (Abbey 1816). Mr. V. J. Alan, A.M.I.E.E., is in charge and the area comprises Essex, Herts, Middlesex, Bucks, Surrey and Kent.

With reference to the registration of **F. K. Smith, Ltd.**, 92–94, Whitechapel, Liverpool, 1, which was published in our 30th April issue, the company asks us to emphasize that its main business is that of wholesale electrical and radio supplies.

Catalogues and Lists

Antex, 3, Tower Hill, London, E.C.3.—Illustrated leaflet announcing a new range of "Oryx" miniature soldering instruments.

Hotpoint Electric Appliance Co., Ltd., Crown House, Aldwych, London, W.C.2.—A folder illustrating the new "Hotpoint H.30" refrigerator including a butter conditioner.

Geo. Becker, Ltd., Ampere Works, North End Road, Wembley Park, Middx.—Catalogue of electrical accessories including switches, switchplugs, ceiling roses, junction boxes, etc.

Anglo-American Electrical Co., Olive Street, Bury, Lancs.—Illustrated priced catalogue of the "Daybriter" range of fluorescent lighting fittings.

Astral Switchgear, Ltd., Enfield, Middx.—Leaflet illustrating the new "Astral" multiway terminal assembly (56).

Multicore Solders, Ltd., Hemel Hempstead, Herts.—Second edition of "Modern Solders"—24-page booklet of information for planning and production engineers.

Brush Electrical Engineering Co., Ltd., Loughborough, Leics.—Technical publication on Brush power transformers—2,000 to 45,000 kVA (51103).

LIGHTING NOTES

A LARGE scheme of conversion to sodium lighting is proposed by WANDSWORTH Borough Council. Main roads in Putney, Wandsworth Central, Clapham and Streatham are included in the plan, for which the sanction of the Ministry of Transport is being sought. The total cost is estimated at £107,651.

The borough engineer of DARLINGTON has prepared a scheme for improved lighting of classified roads and bus routes, using either 140 W or 60 W sodium lamps. The total cost of the work is estimated at £42,000. It is proposed to carry out part of the work this year at a cost of £10,000 and the North Eastern Electricity Board is to be asked to submit estimates. The Council has received sanction to a loan of £9,600 for improvements to lighting of the Great North Road and has applied for sanction to a loan of £5,140 for improving the lighting in Coniscliffe Road.

SCUNTHORPE Corporation is to seek the approval of the Ministry of Transport to a scheme, estimated to cost £11,050, for the re-lighting of Ashby Road, Church Road, Cemetery Road, Rowland Road and Cliff Gardens. Approval has been received for improved lighting in West Street and Stockshill Road, at an estimated cost of £1,259.

PORTRUSH Council recently considered a scheme submitted by the Electricity Board for Northern Ireland for the fluorescent lighting of the streets of the town. It was stated that the total cost would be about £21,000. Further consideration of the matter was adjourned pending a demonstration of the types of lamps which would be used.

BRISTOL Planning Committee has included £15,000 in the estimates for improved street lighting, about half of this amount being for conversions from gas to electricity.

BLACKPOOL Estates and Housing Committee has approved estimates prepared by the illuminations and public street lighting officer for street lighting on the Grange Park and Mereside estate extensions amounting to £3,370 (74 Group "B" concrete columns with lanterns for h.p.m.v. lighting at an average cost of £45 per lamp, including electricity services).

TOTTENHAM Highways and Works Committee has authorized the borough engineer to invite tenders for further conversions from gas to electric lighting. The total estimated cost is nearly £9,000.

PRESCOT U.D.C. has approved a scheme for sodium lighting in St. Helens Road at a cost of £1,450.

The ESTON (Yorks) U.D.C. is seeking sanction to a loan of £1,286 for proposed electric street lighting on the Lowfields housing estate.

SCARBOROUGH Town Council is seeking loan sanction for £5,150 for installing fluorescent lighting in Harcourt Place, Falconer's Road, Vernon Road, Somerset Terrace, St. Nicholas Cliff and parts of Ramshill Road and The Crescent.

SWANSEA Highways Committee is applying for £15,000 loan sanction to cover the cost of installing improved lighting in various roads in the borough.

SEATON VALLEY U.D.C. is to spend £3,111 on street lighting improvements.

GOSFORTH (Northumberland) U.D.C. is to spend £1,050 on installing Class "A" electric street lighting in Welford Avenue, Riddell Terrace and Kenton Road North.

BLACKBURN Corporation is recommended to approve a scheme, estimated to cost £26,129, for converting the lighting of bus routes and side streets from gas to electricity.

Schemes have been approved by the GREAT YARMOUTH Highways and Public Lighting Committee for improved lighting in Beccles Road and Church Road (£1,260) and Church Lane (£1,007). The Committee has also approved in principle the proposed provision of improved lighting in Alpha Road, Common Road and Suffolk Road at an estimated cost of £1,130.

Mr. E. W. Ratcliffe, engineer to the Aycliffe Development Corporation, has prepared a scheme for installing sodium street lighting in Central Avenue and St. Cuthbert's Way, NEWTON AYCLIFFE.

MITCHAM Corporation is recommended to approve a scheme, estimated to cost £2,630, for improved street lighting in Links Road, Robinson Road, Lewis Road and Sherwood Park Road.

CLITHEROE Corporation is to obtain quotations from the North Western Electricity Board and from the Revo Electric Co., Ltd., for converting street lighting from gas to electricity, at an estimated cost of £10,000.

WALLASEY Corporation proposes to convert lamps in an area east of Seabank Road from gas to electricity at a cost of £6,550.

WHITBY R.D.C. has approved a modified form of street lighting.

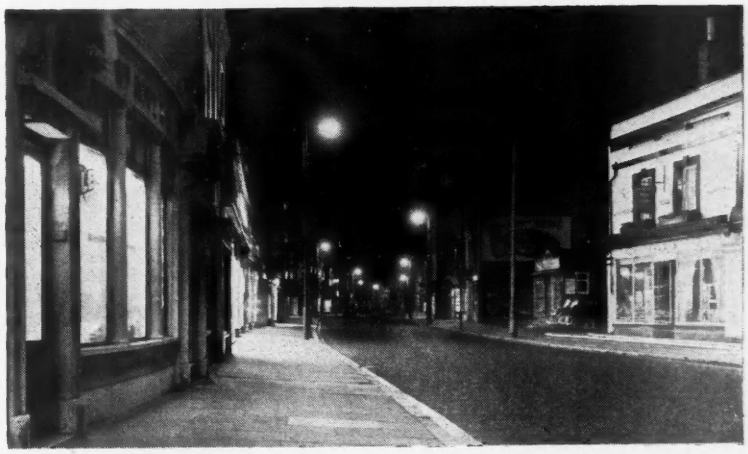
ANDOVER Town Council is recommended to approve a scheme for the conversion of street lighting from gas to electricity.

CROYDON Highways and Street Services Committee reports that schemes have been approved for installing sodium lamps in various roads, and providing new or improved lighting in a number of areas. The total cost of this work is estimated at £15,200.

LANARK County Council has approved schemes, estimated to cost £9,000, for the installation of sodium street lighting at Carmunnock.

The Minister of Transport has approved a tender for the installation of modern street lighting in DOVER, from the borough boundary at Kearsney to New Bridge and from Snargate Street to the Marine Station. The lamps will be on steel columns in the main street and on concrete columns from Snargate Street to the Marine Station.

For an installation covering the route from Gosport Ferry to Brockhurst Cross, Gosport, Hants, 127 "Mazda" sodium street lighting lanterns mounted on Stewarts & Lloyds columns have been used. This is the beginning of a scheme which it is hoped will eventually light the whole of the town. The contractors were the Southern Electricity Board, Portsmouth District, who planned the scheme



LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Expensive "Nut Cracking"

YOUR contributor "Reflector" always seems to take a great delight in applying tensile stresses to the pedal extremities of the writers in the lay Press when they deal with technical matters and become very muddled about engineering and electrical terms, and so often have I heard it said that it is a pity that these writers do not take the trouble to inquire from someone in the know as to the subject about which they are writing and thus avoid misleading not only their readers, but themselves.

"Reflector's" comments on the scheme which is being carried out at the Coventry Abattoir was evidently written without due knowledge of the subject. As a member of the firm responsible for the design of the arrangements in connection with this problem, I should like to ask him, when he suggests a heat pump for this duty, whether he has ever heard of "cracking nuts with a steam hammer"; the same answer can be made about both things—Yes, it can be done, but is rather expensive, particularly on the capital cost side of the question. The amount of energy which has to be put into the soil under a cold store in order to avoid frost-heave is remarkably small and the great advantage of doing this electrically is its simplicity, reliability and ease of control.

I hope "Reflector" will forgive me for what is intended purely as a leg-pull!

*London, W.C.*1. A. W. B. SMITH
(Hal Williams & Co.)

Electricity Charges

WITH reference to "Reflector's" comments in your issue dated 7th May, on the increase of the cost of electricity, he should not group all the inefficiencies of the B.E.A. when arriving at his conclusions: the facts of the matter in the Guildford Area are that in 1938–39 electricity could be purchased from the Guildford Electricity Department at three units for one penny, and the Corporation made a good profit, the South Eastern Electricity Board now charges 1d per unit. At what percentage increase does "Reflector" work that out?

There are several book publishing firms in Guildford but I am not in that trade.

Guildford. CAVE CANEM.

[In his note "Reflector" calculated that the average price of electricity for industrial purposes had risen by 68 per cent between 1938–39 and 1952–53.—*Editors, Electrical Review.*]

Electricity from Atomic Energy

IT is indeed disappointing that Dr. S. G. Bauer, in his résumé of this subject in the *Electrical Review* of 23rd April, gives no hint or hope of the possibility of obtaining electrical energy direct from nuclear reaction. There is certainly no prospect of abundant and cheap electric power from atomic energy in the near or distant future if it is going to be tied down to the antiquated necessity of first boiling water. It is enough to make the miners laugh and Volta turn in his grave.

One feels that the millions of pounds now concentrated on simply boiling water would be better spent in intensive research into obtaining a nuclear primary electric generator which would also automatically neutralize, absorb or convert its own radioactive by-products as simply as if they were manganese dioxide in a Leclanché cell.

*Norbury, S.W.*16. B. S. T. WALLACE.

132 kV Wood Pole Lines

WE were interested to read in your issue of 23rd April, that the B.E.A. are at present erecting what you imply to be the first 132 kV wood pole transmission line in this country. Whilst appreciating that by "this country" you presumably refer to England, we cannot refrain from pointing out that the North of Scotland Hydro-Electric Board has had such a line in commission for the last two years. The line in question runs from Dundee to Aberdeen, a distance of some fifty odd miles, and is of the portal type, similar to that being constructed by the B.E.A.

"SCOTIA."

Heavy Water Moderated Atomic Reactor

SIR JOHN COCKCROFT, director of the Atomic Energy Research Establishment, Harwell, last week cut the first sod on the site of a new reactor at Harwell. This will be the fourth pile to be built at the establishment and the first in this country to use heavy water as a moderator. For the last six years Harwell has had available two piles, BEPO and GLEEP. They have been used for research in a very wide range of subjects, in particular for work carried out in connection with the design of the plutonium producing piles now in operation at Windscale and the newer nuclear energy electricity generating station now under construction at Calder Hall. However, the more advanced types of power pile to which Harwell is now giving detailed consideration are likely to operate at a much higher intensity than has been the case previously, and this should lead eventually to a reduction of capital costs and lower overall costs of reactor operation.

Accordingly, it has been decided to build at Harwell, in addition to the zero energy fast fission reactor which has now been operating for some two months, a small research reactor operating at a very high intensity to permit the necessary experimental studies to be carried out. Besides fulfilling this function the new pile will make it possible to produce certain radioactive isotopes such as cobalt 60 which cannot be made with sufficient specific activity in BEPO. Until now BEPO and the Windscale piles have been the main source of the radioactive isotopes in which A.E.R.E. has a large international business. The new reactor will use as fuel highly enriched uranium which will be supplied from the diffusion plant operated by the Atomic Energy Industrial Group at Capenhurst.

The general design of the new pile is being undertaken by the Atomic Energy Research Establishment, whilst the detailed design and provision of the reactor components will be a responsibility of Head Wrightson Processes, Ltd. The Ministry of Works are undertaking the civil and general mechanical work in connection with site services, building and installation.

Nechells "B" Generating Station

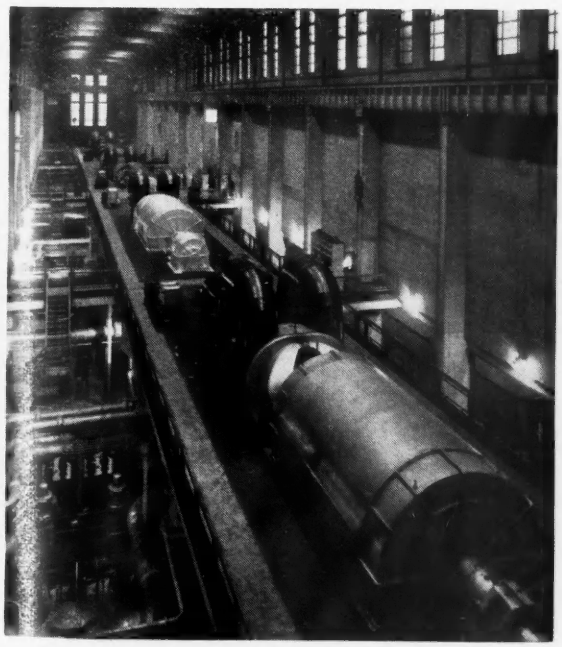
Combustion of Coal and Coke Dust

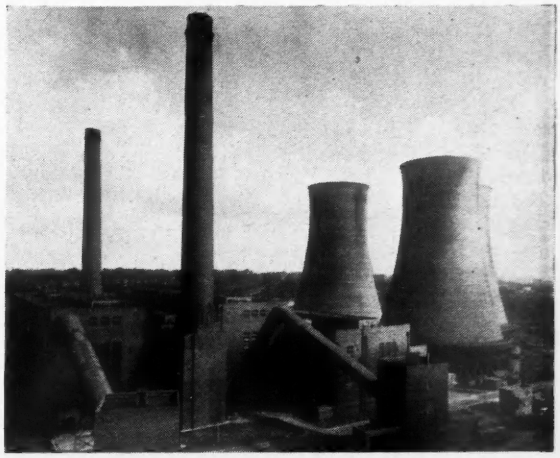
Achieves Low Generating Cost

LAST week the new 210 MW Nechells "B" generating station of the Midlands Division of the British Electricity Authority was officially opened by the Lord Mayor of Birmingham, Alderman G. H. W. Griffith, J.P. Although this station has no claim to special merit among power stations generally, it does rank high in the list of stations in the Midlands Division of the B.E.A. on account of its low cost of generation, which is achieved by burning a mixture of coal and coke dust. With its power units giving increased output at a higher thermal efficiency, it is intended ultimately to supersede the existing "A" station.

The complete project was initiated by the former City of Birmingham Electric Supply Department under the then chief engineer and manager, Mr. F. W. Lawton, M.I.Mech.E., M.I.E.E., A.C.T. (Birm.), who later became controller of the Midlands Division of the B.E.A. The work was continued after nationalization very largely by the same constructional staff. Nechells "B," now in almost full operation, is one of the nineteen generating stations in the Midlands Division of the Authority at present under the control of Mr. R. L. Batley, O.B.E., A.M.I.Mech.E., the divisional controller.

The turbines are arranged in line, the two in the second half of the station being of opposite hand to those in the first half





The main building housing the plant is of brick-panelled, steel frame construction a little over 500ft long, nearly 400ft wide and 105ft high. In the design of the station buildings particular attention was given to details of the external appearance in order to present a dignified exterior in keeping with the functional character of the station without resorting to expensive and lavish ornamentation. This is particularly exemplified by the 350ft high chimneys, situated one at each end of the main building.

Although site work was started in 1946 the shortage of materials, steel in particular, has had an adverse effect on the completion of the station. However, following commencement of delivery of the plant to the site early in 1950 the rate of progress was increased and the first boiler and turbo-alternator were put into commission on 30th June, 1951. The commissioning of the second machine followed within six months and now the complete installation of four turbo-alternators is in operation. Ten of the twelve boilers forming the complete steam raising plant are now operational, and the other two are due for completion later in the year.

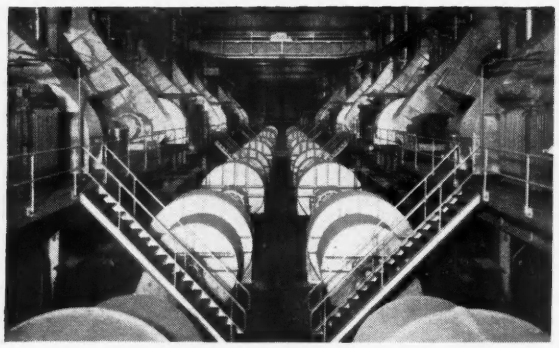
The Steam Cycle

In the turbine room the machines are arranged in line, the two in the second half of the station being of opposite hand to those in the first half. The main purpose of this arrangement is to give shorter steam pipe runs between the boiler house and the turbine rooms, with the added advantage to the operating staff that the steam ends of Nos. 2 and 3 machines are adjacent. Flanking the turbine house on the one side is the circulating water pump and switchgear bay while on the opposite side is the boiler house. The turbine operating floor, standing 18ft above basement level, is carried the full length of the station with extensions to the wall on the one side to provide annexes for the turbine gauge boards, and on the other side to give access to the boiler house.

The upper floor of the circulating water pump bay accommodates offices for the administrative and operational staff in one half of the station, and main switchgear for Nos. 3 and 4 turbo-alternators in the other half, each being centrally disposed about the control room which is situated on the centre line of the building. Access to this floor is

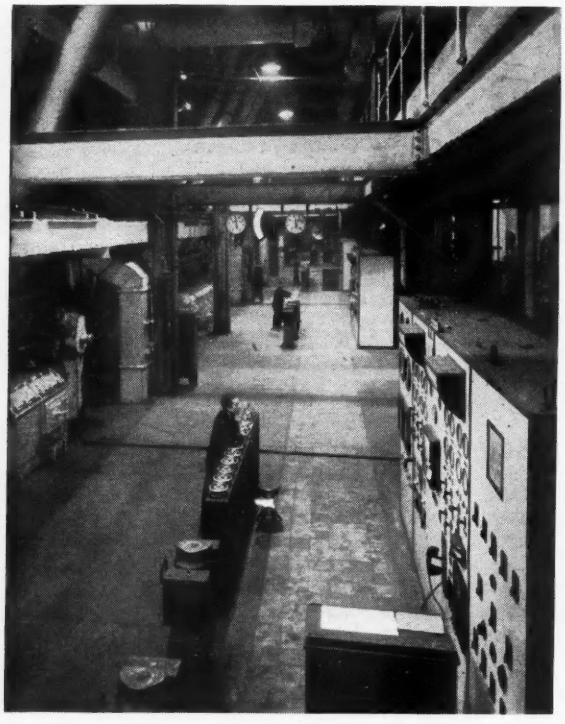
gained from the turbine operating floor. Between the turbines and the boilers is the heater bay accommodating the feed heating plant, the unit evaporators and the feed pumps associated with each machine, together with certain auxiliary plant such as the central evaporating plant, air compressor plant, etc.

The boiler house contains two rows of boilers, each row parallel with the turbine room. The firing aisles are arranged on the outside of each row and at the same level as the turbine operating floor. Between the rows of boilers is the fan bay containing the induced and forced draught fans and motors, with their associated induction regulators, the main flues and the grit collectors. This plant is located on three levels, the forced draught fans being mounted on two galleries running the length of the station behind the boilers and the induced draught fans at the firing floor level. Below this level are the grit collectors and the main flues, the arrangement of the flues permitting a chimney at each end of the station, centrally disposed between the two lines of boilers. The arrangement of the plant in this bay, which is served by an electric overhead travelling crane, is designed to ensure ease and speed of maintenance of the various units. Beyond the boiler house is the workshop annexe housing the mechanical and electrical workshops, the station stores and offices for the maintenance personnel.



The fan bay is between the two rows of boilers and contains the induced and forced draught fans and motors, with their associated induction regulators, the main flues and grit collectors

The boiler firing aisles are on the outside of each row of boilers and at the same level as the turbine operating floor



The coal handling plant comprises two sets, one for each line of boilers, of duplicate wagon tipplers, gravity bucket conveyors, and inclined belt conveyors, with shuttle belt conveyors built over the coal bunkers. The plant is designed to handle standard railway wagons of between 8 tons and 20 tons capacity and each of the wagon tipplers, with its associated conveyors, will elevate fuel to the bunkers at the rate of 120 tons an hour. The coal and coke mixing hoppers are situated at the top of each of the gravity bucket conveyor houses, which ensures adequate mixing of the fuel before it passes to the belt conveyors. Up to the present, practically all the fuel used on site has been rail-borne, but arrangements are in hand to install a combined road/rail tippler with belt conveyors to the existing plant.

Boiler Plant

The steam generating section of the station consists of twelve International Combustion boilers, each having an evaporative capacity of 230,000 lb/hr from feed water at the economizer inlet at 340 deg F. The steam conditions at the superheater outlet are 675 lb/sq in and 850 deg F. Each unit comprises radiant boiler, superheater, economizer, air heater, stoker, draught plant and grit collecting plant.

The stoker is of the twin " L " type, 32ft wide and 22ft long, with a rating of 46·2 lb of fuel per square foot per hour. This is set in a " Lopulco " fin tube combustion chamber with a short refractory front arch and completely cooled rear arch. The combustion chamber volume is 9,800 cu ft with a rating of 2,800 B.Th.U./cu ft/hr. There are four boiler drums, including a steam receiver.

Superheating is effected by means of horizontal tube drainable elements coupled to headers, the primary inlet elements being connected through the steam receiver to the steam drum. Steam temperature control is by means of a gas by-pass damper. The economizer has gas and water in contra-flow and is of the steaming type, three banks high.

The draught plant comprises two induced, two forced and two secondary air fans per boiler, the secondary air fans being at basement level, below and toward the front of the boiler. Air for combustion is taken from the top of the boiler house to assist ventilation and is then passed through a plate type air heater arranged for air recirculation.

On leaving the combustion chamber the gases pass upwards through the superheater zone, downwards through the economizer, and then through the air heater to the multi-cellular type grit collector and the induced draught fans.

The forced and induced draught fan motors and the motors for stoker drive are all variable speed alternating current commutator motors, speed control being exercised by induction regulators.

The boilers were designed to burn a mixture of coal and coke dust in the proportion of 4 to 1, the fuel having a gross calorific value of 9,758 B.Th.U./lb, with 12·2 per cent moisture, 17·3 per cent ash and a volatile content of 22·3 per cent. The overall efficiency on the gross c.v. was guaranteed to be 83·5 per cent at maximum continuous rating. This figure was, however, improved upon by a small margin in the official acceptance tests.

The generating plant consists of four 52,500 kW turbo-

In the control room a high percentage of natural light is available from both skylight and windows

alternators each complete with its own surface condensing and feed water heating plant. The turbines are of the three-cylinder type driving, at 3,000 r.p.m., a main 50,000 kW alternator and a 2,500 kW auxiliary alternator. They are designed to operate with steam at 650 lb/sq in and 825 deg F. A separate steam chest mounted alongside the turbine contains two governor valves and a separate emergency stop valve, all valves being operated by oil from a pump driven from the end of the h.p. turbine shaft.

The steam expands in the h.p. cylinder from 650 lb/sq in down to approximately 135 lb/sq in when it is led through a pipe, below the operating floor level, to the i.p. cylinder where it is expanded down to 13·0 lb/sq in and then finally through two overhead pipes to the l.p. cylinder where it is further expanded down to the exhaust vacuum of 28·5in Hg at economical load. Steam for feed water heating is tapped from the turbine at four points where the absolute pressures at full load are about 180, 64, 16 and 6·5 lb/sq in. This permits of the condensate being heated regeneratively to 357 deg F when the turbine is developing its maximum rated output.

The steam from the two exhausts of the l.p. cylinder flows into a double-inlet single condenser with a cooling surface area of 60,000 sq ft and requiring 40,000 gal/min of cooling water, arranged to flow in two passes. Air is extracted from the condenser by three 50 per cent duty two-stage steam jet operated air ejectors. The associated pumping plant consists of two 100 per cent duty condensate extraction pumps and three 50 per cent duty circulating water pumps. These are all of the vertical spindle type, driven by 3·3 kV slipring induction motors, each having b.h.p. of 80 and 580 for the extraction pumps and circulating water pumps respectively.

The extraction pumps discharge through the two l.p. feed water heaters and thence to the feed pump suction main. There are two 100 per cent duty feed pumps for each turbine unit, one motor driven and one driven by a steam turbine, which is normally the stand-by unit. Each feed pump is capable of discharging 600,000 lb/hr of water through the two h.p. heaters and thence to the feed range and the boiler units, with a discharge pressure at the pump of 880 lb/sq in.

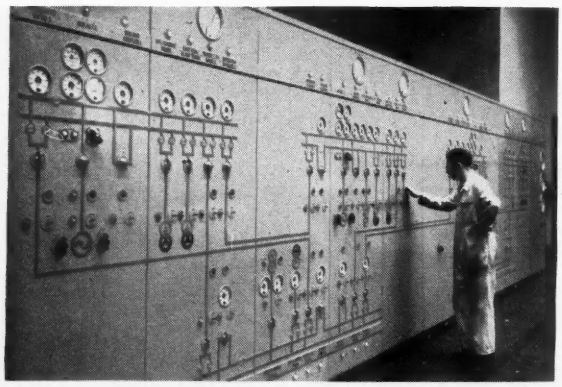
The main alternators are designed for a voltage of 11 kV and 0·8 power factor at the busbars and the auxiliary alternators generate at 3·3 kV and 0·8 power factor. The exciters for the main and auxiliary alternators for each machine are alongside the alternator foundation block at basement level. These are motor driven at a nominal speed of 1,000 r.p.m., the auxiliary or pilot exciter being mounted on the same shaft as the main exciter. The pilot exciter supplies the field of the latter at a constant voltage, thus ensuring electrical stability.

The cooling of the main alternator is effected by means of two separately-driven fans operating on a closed circuit. The air coolers are accommodated in the alternator foundation block and are provided with water from the condenser circulating water system. The auxiliary alternator has its own cooling circuit, the air being circulated by means of a fan mounted at each end of the rotor and a separate cooler is provided, taking water from the same source.

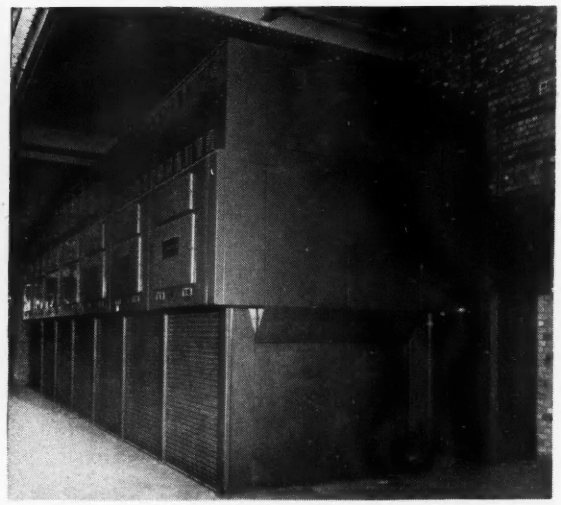
Cooling Water Supply

The make-up water for boiler feed is obtained from two bled steam evaporators associated with each turbine, arranged to give 2 per cent make-up at all loads when operating double effect and 4 per cent when operating single effect. A separate live steam evaporating plant gives an auxiliary supply of 25,000 lb of distilled water per hour. The water supply to the evaporators is obtained from reserve tanks in the station, which are fed from the town's supply after treatment in a base exchange softening plant supplied by Thompson-Kennicott, Ltd.

The three cooling towers are of ferro-concrete construction and are each 296ft high. The capacity of each tower is 3,200,000 gal/hr with a cooling range from an inlet temperature of 92 deg F to an outlet temperature of 76 deg F with a wet bulb temperature of 56·3 deg F and a humidity of 80 per cent. Cooling pond make-up water



One of the G.E.C. switching control panels



General view of some of the main switchgear

is taken from the River Tame by four pumps, each of 3,000 gal/min nominal capacity. To supplement the river water a supply is also taken from the adjacent Birmingham and Fazeley Canal. The ash from the boilers is sluiced by a continuous closed-cycle water system to a large settling sump on the west side of the station building.

Because local industry within a radius of 2 or 3 miles will absorb most of the power from the station, the alternators generate at 11 kV. Provision for interconnection with the grid is, of course, arranged. Due to the necessity of keeping the "A" station in operation during the construction of the "B" station and retaining five of the "A" station machines in service, considerable ingenuity was required to modernize and re-cable switchgear existing in the old station in order to use it for Nos. 1 and 2 machines in the "B" station. For these reasons the electrical system of the station is somewhat complex.

The main 11 kV switchgear controlling the output of the first two machines comprises two groups of cellular gear situated in the "A" station which has been uprated to 1,000 MVA. The switchgear controlling the third and fourth machines comprises two groups of metalclad gear, also of 1,000 MVA rating, which is in the "B" station building.

Cabling between the new station and the existing cable tunnel in the "A" station necessitated the construction of a cable tunnel between the two stations. Longitudinal and cross cable tunnels arranged within the building provide ready means of internal cabling, but cable ducts were necessary to pass existing sewers and drains encountered on the tunnel interconnecting the "A" and "B" stations and also the tunnel between the "B" station and the nearby grid substation.

Extensive use of reactors was necessary to limit the fault power on the main busbars and also on the Area Board distribution gear. This latter gear is divided into five groups in the "A" station, and, at present, two groups in the "B" station. The new distribution gear is of 250 MVA rating and that existing in the "A" station has been suitably uprated. Each of these seven groups is fed from the main busbars via a 30 MVA booster reactor with automatic voltage control.

The station auxiliary supplies are obtained from the four 2,500 kW auxiliary alternators and three 11/3·3 kV, 6,000 kVA station transformers. The works supply switchgear comprises 3·3 kV and 415 V air circuit breakers. The 3·3 kV switchgear is of duplicate busbar construction with off-load selection and is rated at 150 MVA. Each circuit breaker is solenoid operated, suitable for remote, local or emergency manual operation and arranged as a horizontal draw-out unit of the truck type.

The works transformers are connected to the rear busbars and the auxiliary alternators to the front busbars. The auxiliary alternator couplings are so arranged in relation to the main alternator rotors that the auxiliary alternators can be paralleled with the works transformers as the main machine is brought up to load and also when load is being reduced prior to shutting down. The range of loading of the main alternator at which this operation can be carried out is sufficiently wide to prevent any difficulty in operation. Consequently, the auxiliaries are first run up on the station bars and then transferred to the auxiliary alternators by switching via the busbar coupler circuit breakers.

The larger auxiliary motors operate at 3·3 kV and the smaller auxiliaries, lighting and general services, operating at 415/240 V, transformed down from the 3·3 kV supply, are controlled by 415 V single busbar 25 MVA air-break switchgear. This gear is built up into panel units, each circuit breaker being incorporated in a totally enclosed floor mounted sheet steel cubicle, having a horizontal draw-out isolation feature and arranged in single tier formation.

The control room is light and airy, having a high percentage of natural light available. The main mimic diagram remote control switchboard, which is 102ft long, is arranged in a semi-circle around the control desk, with the 3·3 kV control board for the works supply on the opposite side of the room.

The main contractors for the new "B" station were Sir Robert McAlpine & Sons (Midlands), Ltd., and R. M. Douglas (Contractors), Ltd., civil engineering works; C. Bryant & Son, Ltd., main building superstructure; Fred Mitchell & Son, Ltd., cooling towers and ponds; P. C. Richardson & Co. (Middlesbrough), Ltd., brick chimneys; C. A. Parsons & Co., Ltd., turbo-alternators and condensing plant; Stewarts & Lloyds, Ltd., circulating water pipework, high pressure pipes and steam receivers; International Combustion, Ltd., boiler plant and ash handling plant; Mitchell Engineering, Ltd., coal handling plant; Sir William Arrol & Co., Ltd., electric overhead travelling cranes; General Electric Co., Ltd., main 11 kV switchgear; English Electric Co., Ltd., auxiliary switchgear; C. A. Parsons & Co., Ltd., and the B.T.H. Co., Ltd., machine and busbar reactors; British Electric Transformer Co., Ltd., booster regulators; Ferranti, Ltd., and Yorkshire Electric Transformer Co., Ltd., works supply transformers; British Insulated Callender's Cables, Ltd., main and auxiliary cables.

Research at the National Physical Laboratory

Progress During the Past Year

TO provide engineers and physicists with an opportunity of familiarizing themselves with the research and development work which is being carried out at the National Physical Laboratory under the directorship of Sir Edward Bullard, F.R.S., the annual "Open Day" was held on Friday last. At the same time the N.P.L. report for 1953 was published by H.M. Stationery Office for the Department of Scientific and Industrial Research, price 3s. In this document approval of a proposal for a new research division at the Laboratory is mentioned. The new division will work on the automatic control of experimental, industrial and administrative operations and the development of techniques and equipment for data processing and computations. In it will be incorporated the present Electronics Section and the Control Mechanisms Section of the Metrology Division.

In the Electricity Division the new 3·2 MV surge generator, which has a storage capacity of 77 kWsec, makes maximum use of the clearances available in the present High Voltage Laboratory. It supersedes a 2 MV generator, with a storage capacity of 20 kWsec, which was approaching the limit of its useful life and had become inadequate for the work for which it was required. Details of the new generator were given in our issue of 30th April.

Diffraction Grating Development

For some time the Laboratory has been developing a new method, suggested by Sir Thomas Merton, for making diffraction gratings. Although primarily intended as components of spectroscopes for analysing radiation, the "Merton-N.P.L." gratings are finding a very useful application in industry. They can be used for precise measurement of length and the control of machine tools. For these purposes long accurate transparent gratings are needed. By the new process they can be produced quite cheaply.

If two of these gratings are placed one upon the other with their rulings inclined at a small angle dark lines or fringes are produced. They run at right angles to the rulings, and resemble the "moire" effect of watered silk. If, now, one of the gratings is kept at rest and the other is moved very slowly in the direction of the fringes, the fringes are found to move also but at a greatly magnified rate. The number of them which pass across the field of view can readily be counted by a photo-cell and electronic counter. This method lends itself to very accurate and rapid measurement, for when gratings ruled with 10,000 grooves per inch are moved in this way the fringe counter will record the movement in ten-thousandths of an inch.

An industrial firm is collaborating with the Light Division in applying this method to the control of machine tools, such as jig borers, and is working out a further application of it to the automatic control of machines. When this work is completed it will be possible for elaborate machining operations to be performed from instructions stored up in a tape machine.

An infra-red grating monochromator has been designed in the Light Division to indicate or record small changes in the composition of solid, liquid and gaseous mixtures by observation of their absorption spectra in the infra-red region of the spectrum. High dispersion and resolution are obtained at low cost by the use of a "Merton-N.P.L." replica diffraction grating with a selective filter, cheap spherical concave mirrors and simple slits. Two models are shown, differing only in size and in the type of infra-red sensitive detector used. In one model, a lead selenide photoconductive cell is used and in the other a standard Golay pneumatic detector.

For use as a process control instrument it is set on a wavelength at which the particular substance, whose concentration it is designed to control, has an absorption band. An increase or decrease in the concentration of the sample is then shown as a fall, or rise, in output in the meter reading. The concentration may then be controlled either manually or automatically by means of a servomechanism.

In the Mathematics Division a new large servo-connected differential analyser has just been brought into operation. Such machines, based upon the mechanical representation of numerical quantities by means of shaft rotations, were first conceived for solving differential equations by Lord Kelvin in 1876. The first practical machine was built in the U.S.A. in the late twenties and the Laboratory has had the use of a machine similar to this original American version for several years.

Much experience has been gained on the old machine. Since many research problems in physics and engineering involve the solution of differential equations, the machine is of great value; but it is now realized that the full scope of differential analysers is much wider than that originally envisaged. During the "Open Day" the new machine is shown drawing two perspective views of a 3-dimensional mathematical curve, to give, with the aid of a stereoscope, a full 3-dimensional representation of the curve.

Although primarily a piece of mechanical apparatus, this new differential analyser is designed to secure the utmost flexibility in operation by transmitting all mechanical rotations through electrical servomechanisms. Some idea of the magnitude of the machine can be obtained from the following data. The main operating room is 60ft by 30ft and contains 29 separate units. With ancillary apparatus, a total floor space of 4,000 sq ft on two floors is occupied by the machine. In connecting together the units, well over one hundred miles of electrical wiring has had to be laid and over 50,000 connections soldered. The 200 amplifiers for the servomechanisms contain a total of 1,000 electronic valves. With the increase in size and flexibility it is hoped that the new machine will be of even greater value in many branches of mathematics, physics and engineering than the earlier mechanical version which has hitherto been used.

"Magnetic Drum" Store

A recent introduction in connection with the ACE Pilot Model is a "magnetic drum" store, holding 1,024 digits on each circumferential track of a rotating cylinder. Shortly, 128 tracks will be available but 32 are now in use. Since calculation can proceed while a delay line is filled from the drum, the overall speed of the machine is hardly affected by the fact that the drum store is nine times slower than the delay lines. The Pilot Model was designed and made at the Laboratory and has been in continuous use for over two years solving problems in mathematical physics, linear algebra, external ballistics, aircraft flutter, etc.

In order to attain the highest efficiency in gas turbines, etc., it is necessary to use the highest possible gas temperatures, thus requiring special constructional materials. To creep test these materials the Metallurgy Division has developed a design of extensometer which has been modified by the National Gas Turbine Establishment and made in a ceramic material by K.L.G. Sparking Plugs, Ltd. With this extensometer it is hoped to attain test temperatures of 1,400 deg C and preliminary tests have already been carried out at 1,200 deg C.

In the same Division is an electrical strain recorder which uses as the sensitive element a transformer whose output can be varied by moving the soft iron core. The variation in output thus achieved can be amplified and used to give a continuous record. Apart from the advantage of a continuous record this type of extensometer has a large range for a given sensitivity, and fracture of the test piece will not damage the instrument. Also, it is thought that after development the overall sensitivity of measurement will be as good as the more conventional mechanical type of extensometer now being used, so that valuable comparisons of performance can be made.

The use of newly developed titanium alloys in certain parts of the gas turbine will result in greater power and weight saving. The most important use will be in the air compressor, whose temperature of operation was previously limited to about 250 deg C when aluminium alloys were used in the construction of the moving parts. Titanium alloys can operate, with increased strength, up to 400 deg C, thus bridging the gap between aluminium alloys and heat resistant alloys.

Melting Furnaces

In the Metallurgy Division foundry there are two types of specialized melting furnaces designed to maintain a high degree of purity of the molten metal. The first is a high-frequency induction furnace in which 50 lb of ferrous alloys can be melted and cast *in vacuo* or in a controlled atmosphere. Its use permits the production of alloys of very closely controlled composition and in particular the oxygen and other gas content of the metal can be kept to the minimum. The furnace coil, supplied with electrical energy at a frequency of 5,000 c/s from a 30 kW motor generator, is placed inside a large steel tank which can be evacuated to a pressure of 0·002 mm mercury by means of two rotary oil pumps working in series. Inside the tank there is a pump for circulating dried hydrogen round the system, finally blowing the dried hydrogen on to the surface of the molten metal which is contained in a hard-fired pure alumina crucible. By this means the metal is deoxidized and the product of deoxidation (water vapour) completely eliminated from the metal. The furnace is being used to make 50 lb ingots of iron and iron alloys of high purity.

The water-cooled hearth arc melting furnace has been designed to melt up to one or two pounds of metals such as, for instance, titanium, which in the molten condition is so reactive it cannot be melted in any refractory crucible without very serious contamination. The hearth of the furnace, made of copper, is water-cooled and melting is effected by an electric arc struck between a tungsten tipped water-cooled electrode and the metal resting on the copper hearth. The furnace can be evacuated but melting is normally carried out in argon at a pressure of about 30 cm of mercury. The argon is purified, after being admitted into the furnace, by melting a large button of titanium which readily absorbs such impurities as nitrogen and oxygen. It is being used for making alloys of a suitable size for subsequent investigation of their constitution by microscopic and X-ray examination.

In the Metrology Division is a semi-automatic reader of experimental records, which is a device for speeding up the reading and tabulation of points from film or paper records or graphs. A spot of light projected on to the record may be positioned by the movement of a control knob. The operator places the spot on the trace or graph at the point to be read, and presses a button. The reading at this point is then automatically typed. There are simple initial adjustments by which the zero point may be set and the scale stretched or compressed. Movement of the control knob adjusts the current through a galvanometer which deflects the spot. A servo system turns this current into a digital form for typing. A programme unit, comprising relays and uniselectors, controls the typing, which is done on a standard electric typewriter fitted with electromagnets on the keybars. The form of the tabulation may be preset in many different combinations.

The system is designed so as to be easily adaptable for use on any form of record. The galvanometer and optical system may be designed specifically for any existing projector or reading unit, the remainder of the equipment being standardized. The present system reads in one dimension only. A two-dimensional model is under construction. With this it will be possible to read the position of a target in the " frame " of a normal cine-film.

Many people nowadays are working with X-rays which may be dangerous to them, and from which they must be protected by suitable thicknesses of absorbing materials. The economical design of such protection is not a simple matter. When a beam of high-energy X-rays (excited at between 0·5 and 5 MV) passes through a block of concrete, some of its energy is absorbed and some scattered in various directions in the form of X-rays of altered wavelength and penetrating power. If the original beam is very narrow the scattered radiation may be unimportant compared with what penetrates the block, and straightforward measurement of the variation of transmission with thickness may be possible. In practice, however, the beams involved are seldom narrow, and the total effect of scattered radiation cannot be neglected; if the block is thick (as will be necessary with the high voltage involved) much of the scattered radiation will itself undergo absorption, with further scattering, and the whole process becomes exceedingly complex. Experiments are in hand in the Physics Division, using the van de Graaf generator (which gives X-rays at a potential up to 2 MV), to determine narrow-beam and broad-beam absorption data for lead, concrete and barium concrete, the three most important materials normally used for protection purposes at these energies.

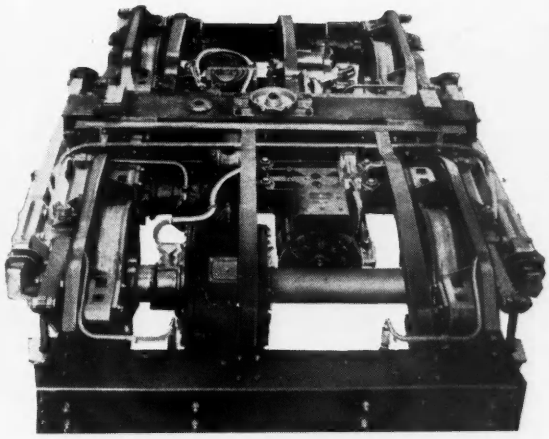
Canadian Water-Power Resources

THE Water Resources Division of the Department of Northern Affairs and National Resources, Canada, in its annual review, gives the recorded water-power resources of Canada as nearly 51 million h.p. at average flow, representing a feasible turbine installation of nearly 66 million h.p. The actual turbine installation at the end of 1953 was 14,929,074 h.p., indicating that less than 23 per cent of available resources has been developed. During 1953, hydro-electric construction was very active with 638,012 h.p. of new capacity coming into operation and with good progress being made on other new developments. Plants and extensions scheduled for operation this year total 1,500,000 h.p. The installed capacity of water-power plants in Canada now equals 1,010 h.p. per thousand of the population. Hydro-electric production in 1953 is computed to be roughly equal to the steam which could be produced by burning 38,500,000 tons of coal.

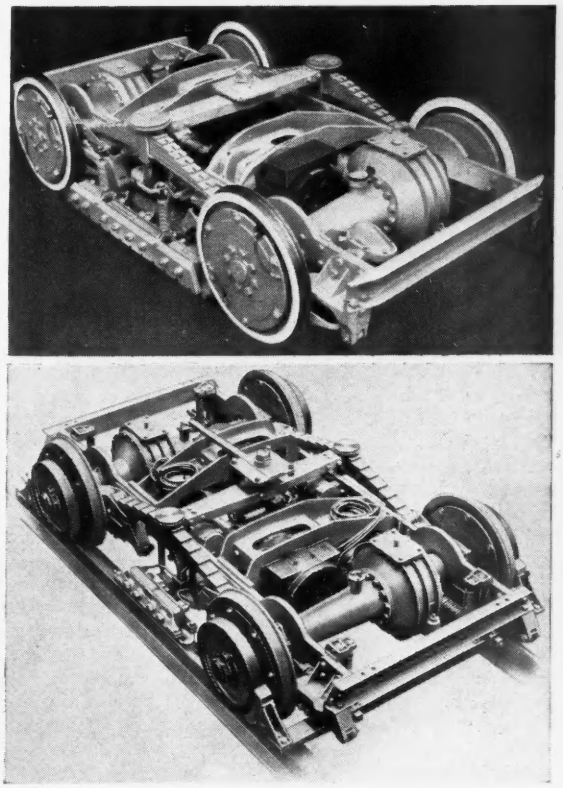
Cardan Shaft Transmission

Its Application to Electric Rail Traction

By E. D. WORTLEY, M.A., A.M.I.E.E.*



The bogie employed in the Toronto Rapid Transit Subway. This application comprises two motors per bogie, and braking in this case is by means of compressed air



A modern tramcar bogie having two motors is shown in the top picture. Resilient road wheels are employed and braking is rheostatic, together with shaft and track brakes. The employment of air or hand brakes has been eliminated on this vehicle. The application shown below is similar, but air brakes are used, and in view of the resilient wheels the air brakes operate on discs as illustrated

In recent years cardan shaft transmission, which was first applied to electric rail traction in the United States, has been further developed in Great Britain. The system comprises frame-mounted traction motors driving through a cardan shaft to a right angle gearbox mounted on the road wheel axle. The gears may be of the spiral bevel hypoid or worm type. By this means it is possible to obtain a much higher gear ratio than can be achieved with spur gearing employed with the conventional type of axle-hung traction motors. Not only can a higher gear ratio be obtained, but what is more important, this higher ratio can be obtained with the smallest wheel diameters that are likely to be required while still maintaining adequate ground clearance.

The use of a higher gear ratio enables higher motor speeds to be employed with a considerable saving in weight as compared with conventional axle-suspended motors. Due to the absence of suspension bearings and nose support, it is possible to employ a circular motor frame of much simpler construction, with consequent elimination of additional machining and expensive jigs and fixtures. Moreover this form of drive enables the motor to be mounted on the bogie frame, and being thus spring borne, reduces the unsprung weight on the road wheels. Although there are many other methods of reducing unsprung weight, they are all relatively complex and require heavy maintenance, and none provides the simplicity and ease of maintenance of the cardan shaft drive. Furthermore, since the motor is completely sprung, wear on bearings and brushgear is less pronounced, and the mechanical conditions for satisfactory commutation are more favourable when the motor and brushgear are not subjected to shock and vibration. Another important advantage not generally appreciated with this type of transmission is the reduction in lateral oscillation of the bogie since this movement is considerably aggravated by the axle-hung traction motor. The reduction in unsprung weight has also a marked effect on track and rail bed maintenance. These factors result in improved riding and passenger comfort, gear noise is much reduced, and in these circumstances the employment of resilient wheels is fully warranted.

It is well known that the clearance of brake dust in underground railways presents a serious problem and expense. With the cardan shaft drive employing high speed traction motors it is possible to fit relatively small shaft brakes, or alternatively disc brakes to the free portion of the road wheel axle, with a consequent saving in brake block maintenance and wheel tread wear.

Thus the main advantages of the cardan shaft system of transmission are: High gear ratio and small road wheel diameter; reduction in size and weight of motor; simplicity of motor manufacture; reduction in unsprung weight; reduced maintenance costs; facility for fitting disc or drum brakes and elimination of brake dust; reduction in lateral oscillation and improved riding; reduced noise level; better mechanical conditions for commutation.

* Chief Traction Designer, Crompton Parkinson, Ltd., Chelmsford.

Engineering in Europe

Abstracts from Foreign Technical Journals

INTERFERENCE effects are often produced on communication lines by h.v. lines and this is obviously due to the strong fields set up by the power lines. For this reason an investigation of these disturbing fields is frequently necessary, although the problem is usually too difficult for theoretical determination, so that only direct measurement, graphical or modelling methods will be available. Yet direct measurements are only possible after the erection of the line in question, so that in the planning stage only modelling of the field, based on the design data, is practicable. It should be considered that the disturbing field is not a simple electrostatic field, but a composite electrostatic and electromagnetic field. The investigation of the possibilities of modelling such a field in an electrolytic tank is therefore a theoretical problem in itself.

The author shows that the resultant field near a three-phase conductor group is a rotating elliptical field which, however, at a certain distance is representable by a pulsating vector field set up by an "equivalent" single conductor. This enables a method of modelling the projected line in the electrolytic tank to be worked out by which the potential distribution around the equivalent conductor may be determined. It is particularly important to determine the scale of the model in a way obviating appreciable errors by the edge effect of the tank walls. The author also shows how to consider this in the preliminary calculations of the model size.—"The Electric Field of H.V. Lines and its Representation by Electrolytic Modelling," H. Schmidl, *E.u.M.*, Vol. 71, No. 4, pp. 81–84, 15th February, 1954, in German.

Selenium Rectifiers

Despite the general, and practically achieved, transition from d.c. to a.c. in commercial power supply, there remain special purposes for which, for a long time to come, d.c. will remain the preferred form of operation. This applies to many industrial drives, electro-chemical processes, traction and crane motors, supply of ships in port, etc. The mercury-vapour rectifier is no longer the only type of rectifier available for the supply of appreciable d.c. power demands and, particularly up to 250 V, cannot compete in efficiency and convenience of operation with selenium rectifiers, whereas in the range up to 800 V and large outputs it has to compete with mechanical contact rectifiers.

Particular advantages of the selenium rectifier are, furthermore, its better efficiency at partial loads and the independence of the character of its efficiency curve of the voltage, which are the reasons why the selenium rectifier even at voltages higher than 250 V may show a better *commercial* efficiency than the corresponding type of Hg-rectifier whose *full-load* efficiency is then superior. The voltage regulation of a Se-rectifier is also more convenient than that of the Hg-rectifier, owing to the former's smooth external characteristic, and is effected by the regulation of the a.c. supply voltage (by step switches, static or rotary transformers or magnetic amplifiers). However, this is economically inferior to grid-control of the Hg-rectifier. The primary costs per kW output and referred to 1,000 A are, up to 450 V, considerably lower for Se than for Hg rectifier plants. Many types of Se-rectifier installations for metallurgical plants, naval, mining and other purposes are shown and discussed.—"Siemens Selenium Rectifiers for the Supply of D.C. Systems," E. Schröder, *Siemens Z.*, Vol. 28, No. 2, pp. 73–79, February, 1954, in German.

Rectifier Transformer Design

Since the rectifier represents a non-linear load for its transformer, it follows that the primary as well as the secondary winding of the latter will have a large content of higher harmonics even if the supply voltage is as nearly sinusoidal as possible. Also, owing to the one-way switch effect of the rectifier, the secondary winding of the transformer will carry current loads only intermittently, and these will be proportionately higher than those of transformers of the same rating for continuous loading. The leakage reactance of the transformer causes lags in the transition of the current from one anode to the following one which accounts for an additional loss of d.c. voltage, and considerably influences the external characteristic of the rectifier. Lastly, arc-backs result in dynamic stresses in the transformer intrinsically different from those set up in transformers serving other purposes.

The author analyses quantitatively all these effects and draws the relevant conclusions for the design of rectifier transformers, considering the main types of transformer-rectifier circuits for full-wave and half-wave rectification. The principles of methods of measuring the losses due to higher harmonics are also outlined, as well as the conditions for magnetic screening of the transformer windings.—"Design of Rectifier Transformers," B. Heller, *Elektrotechn. Obz.*, Vol. 43, No. 1, pp. 3–10, January, 1954, in Czech.

Impulse Generators

The form of the impulse wave produced by an impulse generator is considerably altered by the transformer or other object tested, and only the flattening of the wave front can be fairly easily explained by the increase of the total capacitance due to the load. For a full and correct interpretation of the whole phenomenon of the reduction of amplitude and duration of the impulse, the characteristic impedance and the charging current of the capacitance to earth of the winding have to be considered.

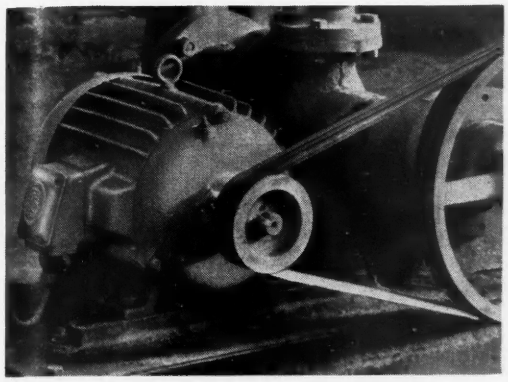
These actually enable the designer to predict the wave distortions and, by considering them in the layout of the impulse circuit, to obtain approximately the required wave-form. The calculation of the correct circuit parameters is then not particularly difficult and does not call for long preliminary tests. Obviously the accuracy of these predictions is limited and this should be considered in drafting regulations for the impulse-testing of very large units by relaxing the rigour of the conditions regarding the time relations of the impulse wave.—"The Layout of Impulse Generators for Transformer Testing," B. Ganger *E.T.Z.(A.)*, Vol. 75, No. 1, pp. 17–20, 1st January, 1954, in German.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.

NEW ELECTRICAL EQUIPMENT

Corrosion Resistant Motors

A RANGE OF squirrel-cage induction motors specially designed for operation in the corrosive but non-explosive atmospheres found in installations such as chemical plants, plating shops, gas works, etc., is now being made by the



English Electric corrosion resistant motor

ENGLISH ELECTRIC CO., LTD., Queens House, Kingsway, London, W.C.2. The motors are made to British Standard dimensions and are available in outputs up to 25 h.p. Although similar in appearance to the normal English Electric class LY, totally enclosed, fan cooled machines, these motors incorporate many unique features that resist the corrosion caused by such things as excessive humidity, salt air and sulphur dioxide fumes.

A moulded phenol formaldehyde fan, mounted on the non-driving end of the shaft, cools the motor by blowing air along axial cooling fins cast integral with the motor frame. Polyvinyl-acetal-covered wire is used for the stator winding, the complete windings being impregnated with phenolic insulating varnish by dipping and baking them four times. Wherever possible, cast iron is used for components forming the external surfaces of the motors. The cowl over the fan is also made of cast iron instead of pressed steel, and all external surfaces of the stator and the fan cowl are finished with a special protective paint. The rating plate is made from polyvinyl chloride to ensure that it is not obliterated by corrosion.

On-Load Tapping Switch

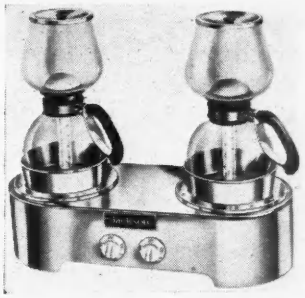
The range of on-load tapping switches made by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, has been augmented by the introduction of a new unit, type O.L. 33/300/19 (N), for use on transformers with 33 kV windings. This switch has a current-carrying capacity of 300 A and, by using the system embodying a centre-tapped reactor, provides a maximum of 19 voltage ratios with 10 tappings on the winding. The minimum step voltage recommended is 1·25 per cent.

The switch is normally arranged for remote push-button control, but local push-buttons can also be accommodated, while automatic control can be provided through the medium of a voltage regulating relay. Facilities for manual operation are always included. For supervisory control, auxiliary switches can be fitted to give remote indication. If two or more units are to work in parallel, further auxiliary switches can be provided to energize an out-of-step relay which, in turn, operates an alarm and locks out the control circuit if the transformers are out of step.

The complete tapping switch is assembled as a self-contained unit and is attached to the transformer by a bolted flange. The unit is divided into three compartments: one houses the three-phase selector switch which serves solely to select the required tapping, no power being broken by the switch contacts; a second houses the cam-operated divertor switches which are of the single break type and serve to interrupt the power circuit; the third contains the intermittent gear and driving mechanism.

Coffee Maker

A glass coffee maker, a new development of a machine which was marketed before the war, has been added to the range of coffee making machines manufactured by JACKSON BOILERS, LTD., Vulcan Works, Shafton Lane, Leeds, 11. It is available in two sizes: the V.E.1 with a single flask is 19½in high, 14¾in wide and 10½in deep and the V.E.2 with twin flasks is of similar



Jackson V.E.2 glass coffee maker

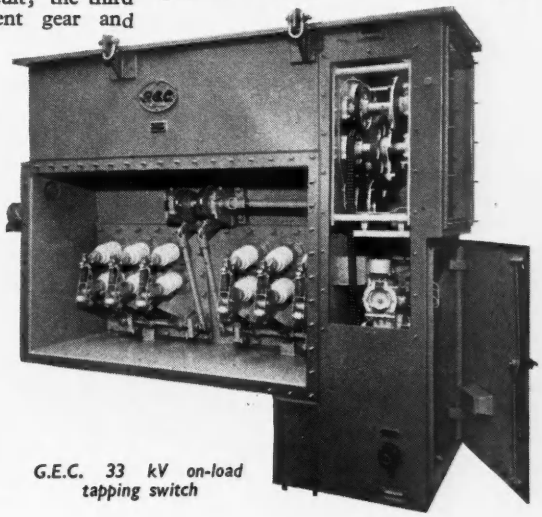
height and depth but the width is 22½in. The respective loadings are 1 kW and 2 kW and each is fitted with "Simmerstat" control. The thermally resistant flasks have a capacity of 3 pints each. The body is of chromium plated copper with stainless steel top and the covers are also chromium plated. Prices are £19 (V.E.1) and £30 (V.E.2) and a funnel stand with drip tray can be supplied at extra cost.

Fan Heater

A 3 kW semi-portable fan heater brought out by HEATOVENT ELECTRIC, LTD., Possilpark, Glasgow, N., can be used both for heating and cooling, push-button controls being incorporated in the top. With an 8in dia. fan, the unit weighs only 8½ lb and is designed for tilting at any desired angle. A thermal cutout is embodied. Available in a range of attractive finishes, it is sold at £12 10s.

Slotted Angle Equipment

DEXION, LTD., 189, Regent Street, London, W.1, has introduced a further development in light slotted angle constructional materials, "Dexion 225." It is said to be smaller, lighter and stronger than the original Dexion and lower in cost. It can also be overlapped and spliced; short lengths can be used up and lengths will nest inside each other for extra strength if required. The dimensions are 2¼ by 1½in.



G.E.C. 33 kV on-load tapping switch

Single-Phase Traction at 50 Cycles

Discussion on I.E.E. Papers

THE discussion on the I.E.E. papers entitled "Electric Traction using 50-c/s Current" and "Electrical Locomotives on the Valenciennes-Thionville Line" by Messrs. Garreau and Nouvon and summarized in the *Electrical Review* of 7th May, was opened by Mr. S. B. Warder (British Railways). The tendency for maximum speeds on the railways to decline and on roads to increase, he said, had offset the advantage formerly enjoyed by the former. The high-speed record of 150 m.p.h. recently made in France was therefore a timely demonstration of what electric traction could do.

The use of the 50 c/s system was for Britain essentially a question of traffic density and electrical clearance. With a total route mileage 20 per cent less than that of France, our traffic was nearly twice as great and our trains lighter and shorter, so that proportionately more electric tractors would be needed. So long as the 50 c/s tractors were more expensive than their d.c. counterparts, therefore, the advantages for this country were not so great. The effect of the 50 c/s system was to eliminate a large number of fixed substations by using a multiplicity of mobile substations. Heavy civil engineering work would be necessary to give adequate clearance in tunnels and low bridges. The British Transport Commission proposed to make a survey of the main line systems to establish the facts.

Mr. J. Pugh (B.I.C.C.) suggested that the possible saving of one-third of the cost of the catenary system with 50 c/s might be lost owing to the civil engineering work necessary at over-bridges and in tunnels to provide extra clearances. Two lines of investigation now being pursued concerned insulators and the use of small pantographs in tunnels. A minimum withstand voltage for polluted tunnel insulators could be determined for cleaning, and the ends of tunnel equipment would be protected by surge arrestors having a flashover voltage slightly below this withstand voltage.

Use of Pantographs

A narrow pantograph was desirable in tunnels to provide maximum electrical clearances, and a wide pantograph outside to permit the use of maximum span lengths without loss of contact between pantograph and catenary due to lateral displacement of the contact wire in strong winds. Two current collectors of different widths, perhaps using a duplex pantograph supporting the two contact surfaces might be used, but this would be expensive and might result in unsatisfactory current collection at high speeds. Alternatively, one of the normal pantographs could be replaced by a narrow one. Another proposal was to operate tunnel equipments at reduced voltage, but this would introduce many operating problems. A third rail in tunnels would have most of the disadvantages of other methods, as well as some of its own.

Mr. J. A. Broughall (British Railways) pointed out that with the one 1,500 V system the substations could be situated at places where the track was sectioned in a very close network, but if, to secure the full economy of the 50 c/s system, the substations were 30 to 40 miles apart, complications would be introduced. Welcoming the single central cab, he suggested that it should be combined with a single central pantograph, which would allow of arrangements to overcome clearance problems in this country. Pantographs on the one 1,500 V lines in this country had given very little trouble.

Mr. A. J. Gibbons (B.E.A.) remarked that the 50 c/s proposals seemed to result in blocks of essentially single-phase load being placed on a three-phase system. Such a load was effectively a negative-phase-sequence load, which tended to limit the effective rating of generators, lines and transformers, and produced a negative-phase-sequence voltage due to the drop in the supply impedance which would then be transferred as an out-of-balance voltage on other networks connected to the main supply system. The supply points should be fed from networks of large normal short-circuit rating, and within an electrically short distance there should be rotating plant capable of dealing with the negative-phase-sequence currents.

Mr. E. H. Croft (G.E.C.) spoke of interference due to rectifier equipments. The equipment on some American locomotives took up much space. For mixed traffic he suggested the use of small locomotives which could be operated in multiple.

Mr. W. J. A. Sykes (British Railways) said that the electrical equipment of locomotives could usually be maintained *in situ*, but not always the more troublesome mechanical parts.

Rectifier Locomotive

Mr. H. Newsam (Metro-Vick) considered the rectifier locomotive to be better than the straight a.c. 50 c/s design. He understood the reason that so few had been ordered for the scheme under discussion was some doubt about the effect of harmonics on the supply, but later experience suggested that that might not be so serious. In efficiency and power-factor the two types were similar and the difference was largely in first cost and maintenance. From their experience the rectifier scheme should be considerably lower in first cost; a simple d.c. motor and rectifier should cost less to maintain than a straight a.c. motor.

Mr. T. S. Pick (British Railways) suggested that the frequency should be pushed up to the maximum that the cable design could accommodate. With a coaxial high-frequency power cable they would no longer be tied to three phases and substations could be much cheaper. D.c. traction made possible the use of multiple-unit stock, which largely solved adhesion problems.

Mr. F. C. E. Smith (Merz & McLellan) said that the range of duties which could be performed by a locomotive intended for both passenger and freight trains was limited by a tractive effort rating available for freight trains and the ability to achieve a sufficiently high maximum speed for passenger traffic. The authors showed the rectifier locomotive to be superior to the a.c. commutator type for both duties. Since an 18-pole commutator-type a.c. traction motor could be declared at 680 or 945 h.p. simply by choosing rated speeds at 50 or 70 per cent of the maximum, the torque and not the horse-power determined the size and weight of a traction motor.

Dr. H. von Bertele pointed out that the authors' great expectations of rectifier locomotives were supported by German and Austrian experts. Recent progress in valve technique might speed up this development, and rectifier locomotives might become the leading type for long-

distance traction on 50 c/s. The authors referred only to ignitron valves, but the excited single-anode type offered great advantages; with excitrons the agitation of the cathode mercury could not cut out current pulses and led to temporary current distortion, with power-factor reduction and more rapid surface contamination of the igniter and its rapid ageing. Excited single-anode valves with spot emission from low-heat resistance anchors offered important advantages. Reduction of the mercury content to one-tenth, of the overall envelope space to one-fourteenth, and the elimination of water cooling were important characteristics of this new development.

Dr. H. R. Klewe (E.R.A.) pointed out that single-phase loads produced voltage unbalance in the supply system, and the rectifier locomotive produced a high amount of harmonics. Inductive interference was sometimes less with 50 c/s than with 16 c/s because a higher voltage was normally employed and therefore a lower current. For open wire lines near a railway, 50 c/s was decidedly worse than 16 c/s, but if telecommunication circuits were cabled the picture was much better, because the screening effect of lead sheath and iron armour improved at higher frequencies.

Mr. D. Wood (Merz & McLellan) expressed surprise that so little had been said about the single-phase/three-phase convertor locomotive, possibly because the induction motor had not been used much in traction, but the absence of commutators and of the complication of d.c. motors seemed a great attraction.

The authors briefly replied.

NEW BOOKS

Introduction to a Study of Mechanical Vibration. By G. W. van Santen. Pp. 296; figs. 216; index. Philips Technical Library. Cleaver-Hume Press, Ltd., 42a, South Audley Street, London, W.1. Price 35s.

At the front of this book it is stated that a revised and extended English, French and German edition will appear. This announcement is of particular interest because it seems clear to the reviewer that, while the work is potentially useful, it should not be left in its present state.

This book shows signs of having been produced too hurriedly. It is a translation and some misprints are doubtless due to a lack of complete liaison between the author and the translator, quite apart from some that owe their existence to faulty proof-reading. For instance, on page 201, there are curves whose ordinates are given as *strain* in kg/mm² whereas the author clearly means stress. Errors of this sort—and this is by no means the only one—will not mislead an experienced reader; but this is an elementary text-book that is intended to be read by students. Incidentally, the c.g.s. system of units is used throughout.

The work is also marred by one or two more fundamental mistakes. On pp. 104–105, for instance, there appears an erroneous theory of transverse waves in rods. Again, the theory of organ pipes, as represented in Fig. 78, needs modification. The remarks made on p. 52 concerning "dynamic flexibility" are misleading when viewed in the light of the theory of mechanical admittance after the manner of Duncan.

Where an elementary text-book is concerned, one is bound to examine the writing for lucidity. Here again, the reviewer believes that improvement is needed. Thus, on p. 9 there appears the statement that "When two vibrations differing in frequency are travelling in the same direction, they will not usually represent a periodic motion as regarded in the combined state; the wave then continually changes its shape." By this the author (or translator) means that

$$A \cos \omega_1 t + B \cos \omega_2 t$$

is not, in general, periodic.

It would be unfair after these comments to leave the impression that the book has no redeeming features. Vibration is the subject of a large number of text-books and yet, despite this, the work under review clearly has a character of its own. The author includes a great deal of information that is not usually given. This is often in the form of numerical data, but also includes introductory discussions on such topics as ultrasonics, vibration detection devices within the human body, seismic waves, and so on. The author's treatment of vibration measurement is particularly instructive.—R.E.D.B.

The Electrical Engineer's Reference Book. Edited by E. Molloy. Pp. 2,184; diagrams 2,065; photographs 280; index. George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2. Price 70s.

The seventh edition of this compact work of reference follows the general arrangement of its predecessors in thirty-two main sections containing contributions by 68 specialists. It has, however, been expanded to include several developments since the publication of the sixth edition in 1952. Among the new items are articles on generators for steam, and gas and water turbines, diesel engine plant, power station batteries, surge protection and testing of high voltage transformers.

Main particulars are given of the 275 kV supergrid; these might well be amplified in future editions, removing any possible impression that 220 kV (referred to *passim*) is the highest voltage in use. Other new matter concerns the testing of a.c. motors, controlled expansion alloys and argon-shielded welding. The section on cables has been rewritten to take account of recent British Standards.

Handbook of Industrial Electroplating. By E. A. Ollard, A.R.C.S., F.R.I.C., F.I.M. and E. B. Smith. Second edition. Pp. 364; figs. 122; tables 72; index. Published for *Metal Industry* by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Price 30s.

The first edition of this book, published in 1947, quickly became recognized throughout the electroplating industry as a practical reference book on all aspects of modern electrodeposition plant and plating technique. The present edition contains new sections dealing with water and drainage, the purification of solutions, safety precautions and ventilation in plating shops, and the special problems of costing in such shops. Many new formulae for solutions as well as details of the latest advances in testing deposits are given, while a number of additional tables for reference have been provided.

The handbook is intended for all those whose duty it is to design, erect, maintain or operate electrodeposition plants, and also for laboratory workers who have to deal with the testing and maintenance of plating solutions.

CANADIAN EXPORTS

Slower Rate of Expansion

EXPORTS of Canadian electrical apparatus last year, valued at $37,705,000, were about one-eighth in excess of the 1952 figure. This result, though evidence of progress, reveals a slackening in the pace of expansion, seeing that between 1951 and 1952 there was an increase of about 90 per cent and between the two previous years one of 60 per cent.

While exports of radio apparatus n.o.p. nearly doubled in value in 1953 those of receiving sets declined appreciably. There was a noteworthy increase in telegraph and telephone apparatus, with decreases in power plant, domestic appliances (except refrigerators) and insulated copper wire. At the same time evidence of the extensive distribution of Canadian electrical goods is striking; 67 countries are recorded as customers for her radio apparatus and 60 for her washing machines.

Class of Goods	1953 $(000)	Inc. or dec. on 1952 $(000)
Batteries, storage	368	+ 22*
To Colombia	199	+ 130
,, Chile	12	+ 7
,, Venezuela	54	− 55
,, Ecuador	9	+ 4
,, Bermuda	12	+ 6
,, Ceylon	10	− 3
Batteries, unspecified and parts	39	− 506
To Malaya	11	− 156
,, U.S.A.	17	− 24
Radio receiving sets	994	− 460
To Pakistan	24	− 37
,, Arabia	29	− 49
,, Colombia	96	− 67
,, Cuba	37	+ 3
,, Guatemala	35	+ 34
,, Japan	46	− 27
,, Venezuela	98	+ 55
,, U.S.A.	272	+ 10
,, Panama	26	− 14
,, Peru	35	− 23
,, Thailand	28	− 19
Radio apparatus n.o.p.	22,927	+ 10,089
To United Kingdom	5,870	+ 3,597
,, India	537	+ 530
,, Belgium	324	+ 42
,, Denmark	777	+ 510
,, France	139	− 829
,, Italy	971	+ 259
,, Netherlands	979	+ 712
,, Norway	579	+ 312
,, Venezuela	331	+ 150
,, U.S.A.	11,915	+ 5,814
Telegraph and telephone apparatus	2,387	+ 923
To Australia	375	+ 31
,, Brazil	29	− 92
,, U.S.A.	1,904	+ 1,049
Transformers and parts	718	− 3,576
To Brazil	570	− 3,238
,, Venezuela	59	+ 58
,, U.S.A.	32	− 108
Meters and parts	1,478	− 616
To South Africa	38	+ 20
,, Brazil	640	+ 25
,, Chile	96	− 66
,, Colombia	58	− 40
,, Cuba	130	− 108
,, Guatemala	72	+ 49
,, Mexico	136	− 383
,, Venezuela	63	− 96
Motors and parts	1,002	− 862
To S. Rhodesia	51	+ 41
,, Jamaica	24	+ 12
,, New Zealand	54	− 38
,, Brazil	108	− 20
,, Cuba	25	+ 14
,, Australia	67	− 190
,, Peru	24	+ 8
,, Venezuela	72	− 20
,, U.S.A.	439	− 179
Dynamos, generators and parts	1,678	− 1,739
To Brazil	1,128	− 1,760
,, U.K.	72	+ 51
,, U.S.A.	325	+ 224
Electrical apparatus, n.o.p.	4,073	+ 425
To South Africa	114	− 2
,, India	32	+ 23
,, Jamaica	69	− 1
,, Bolivia	69	+ 60
,, Brazil	1,263	− 1,240
,, Italy	260	+ 91
,, Mexico	118	+ 19
,, Switzerland	64	+ 9
,, U.S.A.	1,805	+ 1,455
Electric cooking stoves	84	− 13
To U.K.	22	− 6
,, Bermuda	15	+ 6
,, Peru	14	− 1
Elec. heating & cooking devices	41	+ 5
To South Africa	7	− 2
,, Bermuda	4	+ 3
,, Mexico	6	− 2
,, Venezuela	2	+ 1
,, U.S.A.	12	+ 8
Washing machines, domestic, electric	626	− 538
To South Africa	60	− 91
,, Brazil	16	− 124
,, Chile	31	+ 13
,, Colombia	25	− 6
,, Iceland	22	+ 5
,, Israel	20	+ 10
,, Paraguay	12	+ 12
,, Panama	17	− 16
,, Peru	99	+ 42
,, Switzerland	101	− 33
,, Venezuela	90	− 8
,, Syria	14	+ 2
Refrigerators & parts, power	462	+ 168
To Colombia	16	+ 9
,, Dominican Republic	20	+ 20
,, Morocco	15	+ 15
,, Panama	35	+ 31
,, Paraguay	34	+ 34
,, Peru	29	+ 29
,, Turkey	26	+ 7
,, Uruguay	71	+ 71
,, Venezuela	75	+ 67
,, U.S.A.	29	− 139
Electric vacuum cleaners	6	− 23
To Mexico	2	− 13
,, U.S.A.	3	− 2
Copper wire, insulated	4,156	− 4,589
To Jamaica	169	+ 112
,, Arabia	315	− 234
,, Colombia	278	− 310
,, Cuba	325	− 500
,, Dominican Republic	147	− 11
,, Mexico	121	− 57
,, Philippines	361	− 452
,, Venezuela	668	− 384
,, U.S.A.	1,271	− 2,159

* Included parts in 1952.

SWISS ELECTRICAL IMPORTS

IN Switzerland's import trade in electrical goods last year Germany gained considerable ground in practically every line. She supplied nearly half the total imports of radio apparatus, which rose in value by about 50 per cent on 1952. Import trade increased moderately in many groups, notably dynamo-electric machinery from France. Meters and measuring instruments, telephone and telegraph apparatus and accumulators were, however, exceptions. The United Kingdom's share of Swiss trade last year was small. (Sw. fr. 12–12½ = £1.)

Class of Goods	1953 Sw. fr. (000)	Inc. or decrease on 1952
Accumulators	2,003	− 214
From U.S.A.	500	− 222
,, France	237	+ 124
,, Sweden	68	− 205
,, Germany	718	+ 144
,, U.K.	306	− 112
Insulators	1,235	− 390
From France	268	+ 148
,, Denmark	817	− 543
,, Germany	82	+ 16
Meters and measuring instruments	5,968	− 941
From U.S.A.	1,961	− 682
,, Germany	2,149	+ 197
,, France	501	+ 133
,, U.K.	715	+ 58
,, Netherlands	414	− 481
Telephone and telegraph apparatus	3,806	− 319
From Belgium	1,880	− 772
,, U.K.	41	− 14
,, Germany	1,565	+ 520
,, U.S.A.	75	+ 20
Radio apparatus	31,277	+ 10,853
From U.K.	2,736	− 100
,, Germany	16,123	+ 8,576
,, Netherlands	3,146	− 38
,, France	2,992	+ 1,685
,, U.S.A.	4,672	+ 727
,, Sweden	47	− 174
Glass rectifiers	103	− 42
From Netherlands	42	− 7
,, Germany	29	− 12
Cables	2,686	− 990
From Germany	1,630	+ 468
Dynamo-electric machines	17,780	+ 2,123
From Italy	1,671	+ 564
,, France	2,160	+ 1,759
,, U.S.A.	2,243	− 144
,, U.K.	1,345	+ 191
,, Germany	9,005	+ 813
Lighting and starting equipment for vehicles	5,423	+ 756
From France	480	− 45
,, U.S.A.	1,665	+ 82
,, U.K.	663	+ 129
,, Germany	2,021	+ 461
Electric incandescent lamps	4,940	+ 335
From Germany	801	+ 251
,, Netherlands	2,026	− 422
,, U.S.A.	1,040	+ 136
Unspecified elec. apparatus over 500 kg.	1,625	+ 1,091
Ditto, 50 to 500 kg.	1,587	+ 273
From Germany	849	+ 194
,, Italy	113	− 45
,, U.K.	291	+ 191
,, U.S.A.	125	− 53
Ditto, 3 to 50 kg.	1,518	+ 29
From U.S.A.	233	− 123
,, Germany	679	+ 205
,, Italy	56	—
,, U.K.	175	+ 35
,, France	219	− 46
Ditto, under 3 kg.	5,188	+ 1,400
From Germany	2,595	+ 961
,, U.S.A.	852	+ 27
,, U.K.	389	− 23
,, Netherlands	421	+ 96

GENERATION AND DEVELOPMENT

Southern Area Topics

AT a meeting of the Southern Electricity Consultative Council at Southampton on 4th May the chairman, Group Captain J. C. M. Hay, O.B.E., D.L., was congratulated on receiving his commission as Deputy Lieutenant of Hampshire and Councillor Billett on his election as the next Mayor of Weymouth.

In answer to the Council's request that it should review its electric cooker terms, the Board stated that the high transport and renovation costs which would be involved prevented the offer of a hire scheme which would be more attractive than the existing scheme of credit sales. It had decided, therefore, as the most practical way of meeting the Council's wishes, to extend the credit period of the latter scheme from five to seven years. The Council accepted the Board's reply but decided to review the matter in twelve months' time.

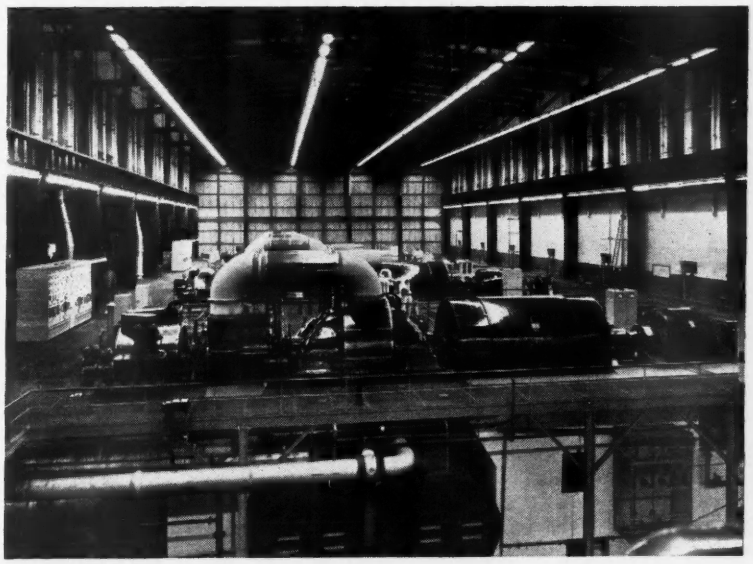
At the instance of the North Eastern District Committee the Council agreed to ask the Board to arrange for the weekly half-day closing of showrooms to coincide with the early closing day of local shops for a trial period.

Record Number of New Consumers

When the Eastern Electricity Board met on 23rd April, it was reported that the number of consumers connected during the year ended 31st March last was 59,021 and that this was the highest figure in any year since the Board first commenced operations in 1948. Altogether 947 miles of new mains were added, and the contracting and sales turnover also reached a record figure, £5,276,000.

Lighting at Rye House

In the boiler house, turbine hall and offices of the Rye House power station, Hoddesdon, Herts, " Atlas " fluorescent lighting has been used almost exclusively. The turbine hall, at present 280ft long by 115ft between crane rails, accommodates four 30 MW 33 kV turbo-alternators each with a 2 MW 3·3 kV auxiliary alternator on the same shaft. Ultimately a further two alternators may be installed bringing the turbine hall up to 420ft long. Lighting is from four rows of " Atlas FKQ/2080 " reflectors mounted on 4in by 4in cable trunking suspended by chains from the roof girders, supplemented by parabolic reflectors beneath the crane rails and across the end wall over the unloading bay. Over 700 5ft 80 W " White (3,500° K) " tubes are used in the turbine hall, giving slightly above 20 lumens/sq ft on the turbine floor and 18 lumens/sq ft in the basement. These figures have been measured after 18 months' service during which only three tubes had to be replaced. Flanking the approach road there are " P.51 " lanterns, each with two 5ft 80 W " White (3,500° K) " tubes, in bronze finish on concrete standards. Similar lanterns mounted in trident formation overlook the ornamental fountain on the green in front of the main entrance.



Fluorescent lighting in the turbine hall at Rye House power station

The lighting was designed and planned by the Eastern Division staff of the B.E.A. in consultation with Thorn Electrical Industries, Ltd., which also supplied all the lighting fittings, tubes and lamps. The installation was carried out by the Hertford District of the Northmet Sub-Area, Eastern Electricity Board.

Tariff Assessment Discrepancies

The North Western Electricity Board is checking domestic consumers' assessments for tariff purposes and has already made amendments where discrepancies have come to light. This was stated by a Board spokesman following the disclosure that a check on 66 homes at Burnage, Manchester, had shown that 34 were incorrectly assessed, all of them being below the correct figure. The North Western Electricity Consultative Council has asked for a meeting with Mr. A. O. Johnson, chief commercial officer of the Board, to discuss what steps can be taken to hasten the check on domestic premises throughout the region. When the domestic tariffs were standardized the consumers themselves provided the details of their " assessable " rooms on which the new tariff was based. Experience has subsequently shown that similar houses frequently returned conflicting figures.

Market Rewiring

Bradford Markets and Fairs Committee has authorized the preparation of an estimate for the complete rewiring of the electrical installation at the John Street Market.

District Heating

Newburn-on-Tyne U.D.C. is investigating the possibility of using waste heat from the new Stella power stations, now nearing completion, for a district heating scheme.

Overhead Lines Policy

A recommendation that Driffield R.D.C. should press for the substitution of overhead electric lines by underground cables wherever possible and that its representatives should raise the matter at the annual conference of the Rural District Councils' Association was referred back at the last meeting of the Council. While agreeing that underground cables were preferable, the chairman said that the cost would be four times as much and he did not think the Council should add to the burden of electricity consumers.

Slotmeters and Cooking

The North Western Electricity Consultative Council has recommended that prepayment meters should again be made available by the Electricity Board wherever their use would encourage the adoption of electric cooking. A member of the Bolton District Committee reported that on one estate of 26 houses only three had electric cookers installed and expressed the view that many people were influenced by the fact that with gas they could have prepayment meters.

STOCKS and SHARES

GENERALLY cheerful and active conditions have continued to prevail in Stock Exchange markets. The gilt-edged market has again been leading the way. Events under discussion at Geneva have been causing hesitancy at times, and the war in Indo-China led to dullness in some parts of the House, but on the whole the industrial market gained further ground. Dividends and results announced by prominent companies have again contributed towards keeping the pot boiling. In that respect, something of a hiatus exists in the electrical equipment section. The majority of the companies which end their year with the calendar have already reported. Results from those which made up their accounts in March are mostly still to come. The G.E.C. final dividend, for instance, is due to be declared in July.

Better Prices

Following the chairman's review at the Babcock & Wilcox annual meeting, the shares picked up practically the whole of the 5s drop which occurred in the previous week, on the decision to hold the dividend effectively at last year's rate. Consideration of the relatively good yield from Crabtree Electrics led to an improvement of 2s 3d in the price of the shares. Enfield Cables recovered strongly to 21s 3d, while Henley's, L.E.W. and B.I.C.C. also improved. Chloride Electricals were again prominent in rising 1s 9d and in the motor accessories group Lucas and S. Smith both went ahead well. Many other useful gains included those in Laurence Scott, B.E.T., Pye, Ekco, English Electric and R. A. Lister.

Plessey Issues

The Plessey Company gave an indication, in the annual report issued last December, of coming capital issues, the details of which have now materialized. During the interval the price of the shares rose from 31s 6d to 50s. They were dealt in up to 51s 9d (although the official quotation remained at 48s 9d) after the announcement of the proposals, which can therefore be judged to satisfy the best anticipations. They include a free share-for-share bonus, and an offer for cash of three new 10s shares at 30s for every five old shares held. Allotment letters are due to be posted to shareholders on 21st May.

Plessey's financial year ends in June. If the new capital proposals are adopted, the intention is to declare an interim dividend of 10 per cent, applicable to the capital as doubled by the bonus issue, but not to the 600,000 shares issued for cash. The latter will qualify in due course for the final, which the board expects will also be 10 per cent on the total £800,000 ordinary stock then in issue. This leaves no firm ground for assessing the shares in terms of the usual yield yardstick.

Week's Price Changes

Company or Board	Nom. Value	Middle price 10th May	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1954 Highest	1954 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	92	+1	3	3	3 5 3	—	88⅞
Brit. Elec. 1974/77	100	91	+1	3	3	3 6 0	90½	87½
Brit. Elec. 1976/79	100	96		3½	3½	3 13 0	97	93 11/16
Brit. Elec. 1974/79	100	105		4¼	4¼	4 1 0	105⅛	103 5/16
Overseas Electric Supply								
Calcutta Elec.	£1	20/-		6†	6†	6 0 0†	20/7	18/7
East African Power	£1	23/-		7	7	6 1 9	23/4	20/7
Nigerian Elec.	£1	23/6		10	10	8 10 3	25/-	23/6
Palestine Elec. "A"	£1	19/-		Nil	Nil	Nil	20/-	16/-
Perak Hydro-Elec.	£1	14/6		Nil	6	8 5 6	15/6	13/9
Equipment and Manufacturing								
Aberdare Cables	5/-	8/6		25	12½*	7 7 0	8/10	8/1
Aerialite	1/-	10/9xd		88½	88½	8 4 3	12/1	10/9
Allen, W. H.	£1	60/-		15	15	5 0 0	60/-	50/-
Aron Elec. Ord.	£1	47/6		15	20	8 8 6	47/6	43/-
Assoc. Elec. Ord.	£1	48/6		20	11¼*	4 12 9	48/6	41/6
Automatic Tel. & El.	£1	68/9		15	15	4 7 3	68/9	62/9
Babcock & Wilcox	£1	56/3xd	+4/9	18	12*	4 5 6	57/-	47/3
Baldwin, H. J.	2/-	4/6	+6d	20	20	8 17 2	5/6	3/9
Bakelite	10/-	25/9		12½	12½	4 17 0	27/6	23/6
British Aluminium	£1	35/6	+1/-	12	10	5 12 9	40/-	34/6
B.I. Callender's	£1	41/6	+6d	10	10	4 16 6	44/-	37/9
B.I. Callender's 6% Pref. ...	£1	26/-		6	6	4 12 3	26/-	24/3
British Thermostat	5/-	23/9	+1/3	30	35	—	23/9	17/6
British Vac. Cleaner	5/-	12/9xd	+6d	25	25	9 16 0	14/6	11/6
Brook Motors	10/-	36/6		20	20*	5 9 6	36/6	33/3
Brush Ord.	5/-	6/-xd	+3d	4	6	5 0 0	7/-	3/6
Bulgin, A. F.	1/-	3/3		30	30	9 4 6	3/7	3/2
Burco	5/-	14/3xd	+9d	35	35	6 2 10*	14/3	12/1
Chloride El. Storage	£1	56/3	+1/9	20	12½*	4 8 9	57/9	46/6
Clarke Chapman	£1	57/6xb		17½	20	—	57/6	47/6
Cole, E. K.	5/-	27/6	+6d	25	25*	4 11 0	27/6	22/6
Cossor, A. C.	5/-	8/-		10	10	6 5 0	8/11	7/-
Crabtree	10/-	27/6	+2/3	17½	17½	6 7 3	27/9	23/9
Crompton Parkinson Ord. ...	5/-	18/-	+1/-	11½	20	5 11 0	18†-	14/-
De La Rue	5/-	13/6	+6d	35	Nil	Nil	14/10	12/3
Decca	4/-	38/-	+2/-	150	35*	—	38/-	28/9
Desoutter	5/-	18/3		18	20	5 9 6	18/7	16/1
Dewhurst	2/-	5/6		19	19	6 18 3	6/3	5/1
Dictograph Tel.	2/-	6/-		20	20*	6 13 4	6/3	5/2
Dubilier Condenser	1/-	5/3	+3d	28	25*	4 15 3	5/3	4/1
E.M.I.	10/-	14/-		12	8	5 14 4	14/9	11/3
Electrical Components	5/-	11/3		20	20	8 17 10	11/6	10/9
Elec. Construction	£1	58/9		15	15	5 2 3	58/9	53/-
Enfield Cable Ord.	£1	21/3	+2/6	5	Nil	Nil	22/3	16/6
English Electric	£1	45/-	+1/3	15	10*	4 9 0	45/-	38/-
English Electric 3½% Pref. ...	£1	16/6		3½	3½	4 11 0	16/6	15/3
Ericsson Tel.	5/-	25/3	+1/-	22†	25†	2 9 6†	25/3	22/9
Ever Ready	5/-	37/-xd	+1/3	35	40	5 8 0	37/-	26/-
Falk Stadelmann	£1	38/9		15	15	7 14 9	41/-	36/6
G.E.C. Ord.	£1	42/6		22½	11¼*	5 6 0	43/9	37/6
G.E.C. 6½% Pref.	£1	27/-		6½	6½	4 16 3	27/3	26/6
General Cables	5/-	16/9		30	30	8 19 2	16/10	16/6
Greenwood & Batley	£1	43/9		15	17½	8 0 0	44/-	40/3
Hackbridge Cable	5/-	14/3	+3d	20	20	7 0 4	14/3	11/3
Hackbridge & Hewittic	5/-	19/6	+3d	20	20	5 2 6	19/6	16/10
Hall Tel. Acc.	10/-	11/-		10	10	9 1 9	11/11	10/7
Heatrae	2/-	4/3		12½	12½	5 17 9	4/3	4/-
Henley's	10/-	18/-	+6d	10½	10½	5 16 8	18/3	15/6
Holophane	5/-	14/9		20	20	6 15 7	15/-	13/1

* After capital bonus. † Free of income tax.

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.

Tentatively, however, on the basis of a 20 per cent annual dividend, and allowing for the value of the "rights," the prospective return can be calculated at a little under 5 per cent. Plessey are estimated to be among the principal beneficiaries from the repeal of the excess profits levy.

Rise in Cromptons

Reference is due to the persistent rise in the price of Crompton Parkinson 5s shares. A further improvement to 18s over the past week carried the quotation to about the best level seen at any rate since the war. They stood at less than 10s a year ago, shortly before the declaration of the increase in the interim dividend; this was the forerunner of a rise in the year's total distribution from 11¼ to 20 per cent. In the market, it is said that the latest improvement in the price follows the final liquidation of a large block of shares. It has put the shares on a yield basis of a little over 5½ per cent.

...in Electrical Investments

Company or Board	Nom. Value	Middle price 10th May	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1954 Highest	1954 Lowest
Equipment and Manufacturing—continued.								
Hoover	5/-	32/9	+1/3	25	45	7 0 9	34/3	26/3
I.C.I.	£1	59/3xd		13	15	5 1 3	60/3	52/9
Intl. Combustion	5/-	22/6		15	20	4 9 0	22/6	14/6
ohnson & Phillips	£1	48/6xd	+3d	15	15	6 3 9	52/3	48/6
Lancashire Dynamo	£1	50/9		12½	14	5 10 3	50/9	43/-
Laurence, Scott	5/-	19/3	+6d	15	20	5 4 0	19/3	14/-
Lister, R. A.	£1	41/-	+1/-	9	12	5 17 0	41/-	31/9
London Elec. Wire	£1	44/6xd	+1/9	15	10*	4 10 0	44/6	38/-
Lucas, J.	£1	63/9	+1/3	9½	10$\frac{5}{6}$	3 8 0	64/4	50/3
Marryat & Scott	2/-	6/6		22½	22½	6 18 6	6/6	5/11
Mather & Platt	£1	66/-	+2/-	12½	15	4 11 0	66/-	53/1
Metal Industries	£1	34/3		15	12*	7 0 0	42/3	29/6
Midland Elec. Mfg.	£1	67/6	+1/3	15	15	4 9 0	67/6	63/-
Morphy-Richards	4/-	16/-		40	40	—	17/-	11/4
Murex	£1	55/-		15	15	5 9 0	56/3	50/-
Newman Ind.	2/-	2/3		10	10	8 17 9	2/6	2/-
Oldham & Son	1/-	3/-		35	17½*	5 16 8	3/4	2/5
Parnall (Yate)	5/-	5/9xd	+3d	6	8	6 19 3	6/6	4/3
Parsons, C. A.	£1	47/6xd	−6d	12½	7½	3 3 3	48/9	38/1
Plessey	5/-	48/9		25	30	3 1 6	53/-	37/10
Pye Deferred	5/-	23/6	+1/6	18	20	—	24/-	15/7
Revo	10/-	18/3	+9d	27½	27½	—	18/3	16/7
Reyrolle	£1	77/6		12½	13¾	3 11 0	80/-	66/-
Rheostatic	4/-	12/-		19	20	6 13 4	12/9	11/-
Richardsons Westgarth	5/-	12/3		12	15	6 2 6	12/3	8/7
Scottish Cable	4/-	14/6		32	20*	4 11 6	14/6	12/11
Siemens Ord.	£1	42/6	−1/3	10	10	4 14 3	43/9	34/9
Smith (England), S.	4/-	10/6	+1/-	12½	15	—	10/6	7/8
Southern Areas	£1	19/6	−6d	5	6	6 3 0	20/-	17/6
Strand Elec.	5/-	8/3		17½	17½	10 12 3	9/3	8/6
Sturtevant	5/-	36/-	+6d	18·1†	18·9*†	2 12 6†	36/-	29/-
Sun Elec.	£1	32/6	+5/-	15	15	9 4 8	32/6	27/6
Switchgear & Cowans	5/-	12/6		22½	10	4 0 0	13/7	9/9
Taylor Tunnicliff	5/-	11/-		25	12½*	5 13 9	12/4	10/7
T.C.C.	10/-	28/9xb		20	30*	—	30/-	21/3
T.C. & M.	£1	32/-		10	8½*	5 6 3	34/6	30/3
Telephone Mfg.	5/-	7/9		10	10	6 9 0	8/6	7/6
Thorn Elec.	5/-	17/-		12½	12½	3 11 5	17/6	13/3
Thornycroft	£1	37/6	+1/3	15	15	8 0 0	37/6	33/4
Tube Investments	£1	65/-	+1/3	15*	15	4 12 3	68/9	60/3
Vactric	5/-	11/3		Nil	Nil	Nil	11/3	7/6
Veritys	5/-	6/-xd		10	12½	10 8 3	8/3	5/-
Walsall Conduits	4/-	50/-		70	70*	5 12 0	50/-	44/-
Ward & Goldstone	5/-	46/3		45	45*	4 17 3	46/3	41/3
Watford	2/-	6/-xd		25	22½*	—	6/3	4/7
Westinghouse Brake	£1	67/-	−6d	14	15	4 9 6	68/10	60/9
West, Allen	5/-	14/6		15	17½	6 0 9	15/3	12/7
Wolf Electric	5/-	12/3		15	17½	7 2 9	13/10	11/-
Trusts, Transport and Communications								
Anglo-Am. Tel.:								
A Ord.	100	81½xd		—	6	7 7 3	89½	—
Ord.	100	54½xd		—	3¾	6 17 7	55½	52
Anglo-Portuguese	£1	23/-	+6d	8	8	6 19 2	23/4	21/-
Brit. Elec. Traction:								
Def. Ord.	5/-	45/6	+1/6	25	35	3 17 0	45/6	39/1
Cable & Wireless:								
Ord.	£1	39/-	−6d	8	9	4 12 4	40/6	26/2
4% Loan	100	97½	+1	4	4	4 2 0	98	95½
Calcutta Trams	£1	17/6		6†	2½†	—	19/3	17/1
Cape Elec. Trams	£1	15/-	+6d	5½	5½	7 6 8	15/3	12/4
Marconi Marine	£1	31/3		10	10	6 8 0	31/3	27/6
Oriental Tel. Ord.	£1	77/-	+3/3	16	16	—	80/6	73/9
Telephone Props.	£1	4¾	−5/-	8	8	—	5 1/16	4½
Telephone Rentals	5/-	10/3	+3d	10	10*	—	10/3	9/1

Parsons Dividend and Earnings

The C. A. Parsons & Co. dividend for 1953, equivalent to 7½ per cent on the present capital, ranks among the most conservative in the industrial market. It involves the distribution of only £128,000 net from a surplus, after tax, of over £800,000. As the chairman points out in his statement accompanying the full report, shareholders receive less than one-tenth of the amount of £1,560,000 paid to the Government in taxation. He emphasizes the continuing need to provide for depreciation on a replacement, as against an original cost, basis. Net profits of the group for the year came out at much the same figure as before, despite the £220,000 rise in the tax charge, which included £360,000 on account of the excess profits levy. The yield of 3 guineas per cent on the £1 shares at 47s 6d is modest in proportion to the six-times earnings cover for the dividend on which it is based.

Shares on Offer

Among the electrical equipment stocks recently on offer in fairly large numbers mention may be made of a line of Oldham & Son 1s ordinary, available in the market at 3s 1½d, yielding 5·6 per cent, and Aberdare Cables 5s ordinary at 8s 7½d, giving nearly 7¼ per cent. Among comparatively new issues, Contactor Switchgear 5s shares have been offered at 14s 3d, and E. Shipton 2s shares at 4s, giving returns of 7·9 and 8·7 per cent respectively on the basis of estimated dividends. Reliance Clifton new 5s shares could be bought at 19s 6d, free of stamp, to give a prospective yield of 5·1 per cent. In the preference lists is a line of Ferranti 5 per cents at 20s 9d, paying 4·8 per cent on the money.

Burco Interim

Burco 5s shares have been marked up to 14s 3d since the declaration of a 7½ per cent interim dividend on account of the current year, which ends in September. This rate goes against last year's corresponding payment of 5 per cent, and it applies moreover to capital doubled subsequently by a share-for-share bonus. The last accounts disclosed an interruption to the steady expansion of trading profits up to then, but there was no difficulty in maintaining the distribution at 35 per cent, with a good margin to spare.

REPORTS and DIVIDENDS

Babcock & Wilcox, Ltd.—The annual meeting will be held on 27th May. Mr. W. L. Fraser (chairman), in his circulated statement, says that the recovery of the steel supply position was not as rapid as had been anticipated in his last review, and output was still affected during 1953 although, in terms of money, the gross figure of turnover was higher than last year. Even now, the retarded supplies of certain steel products give rise to some anxiety. With regard to research, they have built, and have now under test at the Renfrew Works, a boiler fired by a cyclone furnace, the first of its kind in this country, which includes many novel features which may be incorporated in future designs. It has been stated that nuclear energy can be commercially useful in the foreseeable future only through the medium of steam. During the past few years they have been developing designs for such an application. Jointly with the Department of Atomic Energy, they have designed the steam-raising plant for the first atomic power station in this country, and have been entrusted with the manufacture and construction of the plant to be erected at Calder Hall, Cumberland.

Referring to the overseas subsidiaries, the chairman says that Babcock & Wilcox of Australia Pty., Ltd., has greatly expanded its manufacturing capacity, the output to-day being more than treble that of 1950. The Vereeniging works of Babcock & Wilcox of Africa Pty., Ltd., are now in production on a good scale. In Belgium they have entered into an arrangement with Chaudronneries A.F. Smulders, of Liège, whereby the joint interests will be advanced through the developing activities of the associated company, Société Belge Babcock & Wilcox, now re-styled S.A. Babcock-Smulders. Arrangements have been completed whereby their blocked Brazilian funds will be devoted to acquiring boiler-making plant and machinery in Brazil, and to the construction of works for the production of parts at Rezende in the State of Rio de Janeiro. Works at present being built near Mexico City will enable them to retain the boiler business they have enjoyed for many years past in Mexico.

Turning to home subsidiaries, Mr. Fraser says that Bailey Meters & Controls, Ltd., and Edwin Danks & Co. (Oldbury), Ltd., have both had record years, and the results of Dewrance & Co., Ltd., are excellent.

C. A. Parsons & Co., Ltd.—The annual meeting will be held on 25th May. In his circulated statement, Sir Claude Gibb (chairman and managing director) says that orders on hand for turbo-generators ensure full employment for some years to come, but already the transformer division is needing additional orders if it is to maintain full output at the 1953 rate. Advantage is being taken of the lull in transformer orders to revise designs and methods of manufacture in a further endeavour to reduce production costs. At the end of 1953 it was decided to provide greater floor area, heavier cranes and still further improved works testing facilities by building a new erecting and testing bay capable of handling the assembly and testing of turbines and alternators up to or even exceeding 300 MW. Between the present heavy erecting bay and the new one a two-storey shop is to be built containing on the ground floor new condensing plant with the auxiliary equipment necessary for testing the largest units which could be transported in the foreseeable future. The first floor will be equipped for the fabrication of cleading required for the three erecting bays. These additions will be completed by the end of 1954. Improved designs in steam and gas turbines, generators and transformers, and in scientific instruments from the optical division are being developed from their researches. Good progress is being made in the construction of the factory at Whyalla, South Australia.

Shortage of orders and unemployment may not come suddenly, and with a large percentage of industry still possessing reasonably full order books there may seem little cause for concern regarding the future. The nation, however, must be warned of the remarkable reduction in overseas inquiries and the still greater fall in export orders for capital equipment. Orders will only be obtained by beating competitors with an attractive price related to reliability, efficiency, and delivery. Selling prices must be reduced, but so long as industrial taxation is at its present level substantial reductions cannot be made.

Sangamo Weston, Ltd., reports a trading profit for 1953 of £253,709, as compared with £217,408, and after meeting all charges, including £90,185 for taxation, there is a net profit of £105,806 (against £71,996), to which is added £413,586 brought in. Of this £200,000 is transferred to reserve for additional cost of replacement of fixed assets, and it is proposed to pay a dividend for the year of 15 per cent (against 12½ per cent). The balance carried forward, after capitalization of £157,500, is £135,904.

The directors announce that Treasury consent has been received to a proposed scrip issue, and they propose that the share capital be increased to £475,000 by the creation of 315,000 new ordinary shares of 10s each and that £157,500 standing to the credit of profit and loss account be capitalized and applied in paying up the new shares for distribution, fully paid up, to members in the proportion of one new 10s ordinary share for every two held. The board states that the issue must not be taken as implying any greater distribution of profits than the amount proposed to be distributed for 1953.

The Plessey Co., Ltd.—An extraordinary meeting is being held on 20th May at which proposals will be submitted for increasing the ordinary capital from £250,000 to £800,000 and to sanction the capitalization of £250,000 from general reserves for a one-for-one scrip issue.

If the proposals are adopted, the directors intend to declare an interim dividend of 10 per cent. The directors will also offer 600,000 10s ordinary shares at 30s a share to ordinary shareholders in the proportion of three for five. The net proceeds are estimated at £874,000. These 600,000 shares will not participate in the interim dividend. There is also to be an issue of 30,000 4½ per cent cumulative second preference shares of £1 each in exchange for a minority interest in a subsidiary.

Crofts Engineers (Holdings), Ltd.—The annual meeting was held on 7th May. In his circulated statement Sir Arthur Croft (chairman) said that the profits of the group had slightly increased so that once again the figures constituted a record. During 1953 trading conditions became more difficult and there was a substantial reduction in the order book. Conditions in recent months, however, showed an improvement, with a satisfactory increase in incoming business, and the outlook was now encouraging. Sir Arthur referred to the capitalization of £400,000 from general reserves and the distribution of 1,600,000 shares of 5s each to the ordinary shareholders in the proportion of one new share for each share held.

The Atlas Electric & General Trust, Ltd., reports a gross investment income for the year ended 31st March last of £716,353, as compared with £681,136 for the preceding year, and a net income, after providing £317,376 for taxation, of £339,003. After allocating various sums to reserves, it is proposed to pay a dividend for the year of 7 per cent (against 6 per cent)

Tube Investments, Ltd., has declared an interim dividend of 7½ per cent on ordinary capital of £7,247,431, as increased by 350,000 £1 shares issued last December. For the previous year the interim dividend was 7½ per cent on £6,897,431 capital.

The Superheater Co., Ltd.—Consent has been obtained to a one-for-two scrip issue to holders of ordinary and "A" ordinary shares.

Burco, Ltd., has declared an interim dividend of 7½ per cent (against 5 per cent), on doubled capital.

(*Continued on page* 913)

Worthington - Simpson, Ltd., report a net profit for 1953 of £224,996 (against £239,603), after providing £38,000 (£395,000) for taxation and adding £45,000 (nil) taxation overprovided. The final dividend of 10 per cent maintains the year's distribution at 20 per cent. General reserve receives £150,000 (£100,000) and £184,889 (£179,512) is carried forward.

Blaw Knox, Ltd.—At an extraordinary general meeting last week a resolution was passed approving the capitalization of £49,111 which is to be applied in paying up in full 196,444 ordinary shares of 5s each. The new ordinary shares will not entitle the holders to participate in any dividend declared in respect of the year ended 31st December, 1953.

Telegraph Condenser Co., Ltd.—At an extraordinary general meeting following the annual general meeting last week resolutions providing for the increase of the capital of the company to £880,000 by the creation of 600,000 new ordinary shares of 10s each, and the issue of such shares, credited as fully paid up, to shareholders in the proportion of one new ordinary share for each existing ordinary share held, were passed unanimously.

Ever Ready (Ireland) Ltd., proposes to pay a dividend for the year of 12½ per cent (same), plus a bonus of 2½ per cent (nil).

New Companies

Miles T.V., Ltd.—Registered 27th March. Capital £2,100. To acquire the business of dealers in radio and television sets and electrical appliances, etc., carried on by Elsa M. Miles Swift and Brenda C. Mercer as "Miles T.V." at 63a, High Street, South Norwood, S.E.25, and elsewhere. Solicitors: Wood & Sons, 1, St. Andrews Hill, E.C.4.

Pensar (Electronic Wholesalers), Ltd.—Registered 29th March. Capital £100. Wholesalers of electrical and mechanical apparatus and accessories and in particular radio equipment. Directors: L. R. Freeman and P. Goldstone, 1, Fairfield Road, Toller Lane, Bradford.

Bromwest, Ltd.—Registered 12th April. Capital £500. Manufacturers of and dealers in electrical appliances, clothing of all kinds, boots and shoes, etc. Directors: E. Deutsch and F. W. Inns. Regd. office: Fenwick House, 289/93, High Holborn, London, W.C.1.

Neoncraft, Ltd.—Registered 15th April. Capital £2,000. Patentees and manufacturers of and dealers in electrical and neon signs, electric light fittings, etc. Directors: H. C. Madams and Mrs. Lydia E. Madams. Regd. office: 4, Richmond Buildings, Dean Street, W.1.

Cleveland Electronic Products, Ltd.—Registered 21st April. Capital £2,000. C. V. F. Sheppard is the first director. Regd. office: 6, Broad Street Place, E.C.2.

S. Smith (Electrical Fittings), Ltd.—Registered 20th April. Capital £3,500. Manufacturers of and dealers in electrical furnishings and fittings, etc. Directors: S. Smith and Mrs. Winnie Smith. Regd. office: 85, Abercrombie Avenue, High Wycombe.

Liquidations

A.G. Wireless & Electrical Co., Ltd.—Winding up voluntarily. Liquidator, Mr. D. R. Clack, Adelaide House, London, E.C.4, appointed 15th April.

Streamlyne Electrics, Ltd.—Particulars of claims to the liquidator, Mr. A. W. Hunter, Walter House, 418–422, Strand, London, W.C.2, by 20th May.

Monarfon Radio, Ltd.—Particulars of claims by 29th May to the liquidator, Mr. S. O. Henry, Parkin S. Booth & Co., 5, Rumford Place, Liverpool, 3.

Bankruptcies

C. H. Sanders, 15, Watery Lane, Smethwick, Staffs., electrician, lately carrying on business at 132, Florence Road, Smethwick.—Public examination 23rd June at the Law Courts, Lombard Street West, West Bromwich.

J. G. Milne, 34, Whitworth Road, Grangetown, Yorks, radio and electrical dealer.—Last day for receiving proofs for dividend 20th May. Trustee, Mr. C. G. Sparrow, 62–63, High Street, Stockton-on-Tees.

J. L. R. Mack, residing and lately carrying on business as a radio, television and electrical engineer at 5, Priory Road, Tonbridge, Kent.—Last day for receiving proofs for dividend 21st May. Trustee, Mr. J. S. Bradley-Hole, 7, Old Steine, Brighton, 1.

L. A. L. Leech, lately carrying on business as the T. L. Installation Co. (Norfolk and Suffolk) at 129a, Fore Street, Ipswich, contractor and electrical engineer.—First and final dividend of 2s 8d in the £ payable 19th May at the Official Receiver's Office, 3-5, Northgate Street, Ipswich.

Brazilian Imports

Revised Classification of Merchandise

THE new Brazilian import classification, in force from 26th March, is more comprehensive than that of October last (see *Electrical Review*, 4th December, 1953). It includes several items not previously specified, which therefore fell automatically into Category 5, paying a minimum premium of 50 cruzeiros per dollar, or the equivalent in other currencies. Certain other articles have been transferred from lower to higher categories, thereby reducing the cost of imports. Local manufacturers of electrical material complain, in fact, that they will now be exposed to increased competition from abroad, owing to the facilities extended to importers of material similar to that manufactured in Brazil. A few items now produced locally in adequate quantities for home market needs have been transferred to lower categories.

The principal alterations made by the new classification are given below.

Category 1 (minimum premium 10 cruzeiros per dollar): Transformers of over 5,000 kVA and 66 kV; rotary rectifiers of over 500 V for public transport and mercury rectifiers; parts and accessories for radio direction finding equipment to be manufactured in Brazil, or to maintain existing installations; ammeters and similar measuring instruments of laboratory types; oscilloscopes and oscillographs; electrical apparatus for buoys and beacons; electrodes for electrical furnaces; and fog-horns.

Category 2 (minimum premium 12 cruzeiros): Time and seismographic fuses; parts and accessories for making radio valves, including special tubes and bulbs but excluding ordinary types; parts for electric lamps; and electric battery carbon.

Category 3 (minimum premium 15 cruzeiros): Cellulose sheet, etc., for making radio condensers; generators; motors weighing less than 1 kilo or more than 600; transformers, exclusive of frequency, other than those listed in Category 1; induction machines; reactors, except for fluorescent lamps; unspecified electrical machines and apparatus for power supplies; parts and accessories for television receivers, except valves, tubes, bobbins and kits; ditto for telephone apparatus and stations; ditto for portable electro-mechanical tools; sealed-beam lamps for motor vehicles, bayonet types; switchboard type telephone cables; aircraft ignition plug cables; enamelled *Litz* wire; coaxial and other special cables; electric soldering machines; equipment for charging and maintaining batteries and electrifying fences; travelling electric platforms of over 30 tons capacity.

Category 4 (minimum premium 20 cruzeiros): Wireless telegraph and telephone receiving and transmitting sets; telegraph apparatus other than manual, and parts and accessories; dry rectifiers; single-phase measuring instruments; electric burglar and fire alarms; rubber insulated copper telephone wire; fuses, switches, sockets and resistances; industrial fans, exhausters and the like.

Merchandise not specified in one of the first four categories can only be imported under Category 5. As this class includes high-priced automobiles and other luxury goods, for which there is a big demand, and for which less than 5 per cent of the available exchange is allotted, premiums continue at a high level and rose to 130 cruzeiros per dollar in March.

Great Britain's imports from Brazil increased to £28·9 million in 1953, leaving a balance of £11 million in Brazil's favour. The prospects for British trade this year are not very encouraging at the moment. Even if exports to Great Britain increase, there will not be a great deal of sterling left over for general imports after paying £6 million annually towards liquidation of the backlog and £15 million, stipulated in the recent agreement, for petroleum products.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 23rd June from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1949

4675. Ransburg, H. J., Ransburg, H. G., Ransburg, H. P., and Ransburg, E. M. (trading as Ransburg Co., H. J.).—Method and apparatus for electrostatically coating articles. 21st February, 1949. Cognate application 4676, 29th October, 1948. (710852.)

1950

22460. Advance Transformer Co.—Transformer for operating hot-cathode electric discharge devices. 12th September, 1950. (710853.)

26466. British Insulated Callender's Cables, Ltd.—Apparatus for welding together pieces of thermoplastic insulating material. 29th October, 1951. (710856.)

28297. Osnabrücker Kupfer- und Drahtwerk.—Production of electric cables with seamless sheathing of metal. 20th November, 1950. (710858.)

1951

1156. Simplex Electric Co., Ltd.—Holders for electric lamps. 16th January, 1952. (711138.)

1702. Soc Générale d'Electricité et de Radio.—Echo sounding apparatus. 23rd January, 1951. (711139.)

3643. Electric & Musical Industries, Ltd.—Circuit arrangements for deflecting the beam of a cathode-ray tube. 4th February, 1952. (711142.)

4461. Arvin Electric, Ltd., and Ranson, H. L.—Stands for electrical appliances. 22nd February, 1952. (711144.)

6890. English Electric Co., Ltd.—Control systems for dynamo-electric machines. 21st March, 1952. (711147.)

8540. Hotpoint Electric Appliance Co., Ltd.—Electric heating elements. 7th April, 1952. (710941.)

9880. Chamberlain & Hookham, Ltd., Deacon, L. O., and Lewis, H. S.—Protective apparatus for electricity distributing systems. 23rd April, 1952. (710876.)

13072. Standard Telephones & Cables, Ltd.—Electronic switching systems. 1st June, 1951. (711053.)

17382. National Research Development Corporation.—Electron guns. 18th July, 1952. (710954.)

17549. Marconi's Wireless Telegraph Co., Ltd.—Automatic frequency control systems. 11th March, 1952. (711157.)

17637. Kelvin & Hughes, Ltd.—Wire-wound electrical devices. 23rd October, 1952. (711158.)

18146. Sylvania Electric Products, Inc.—Electroplating of germanium. 31st July, 1951. (711065.)

20182. Parsons & Co., Ltd., C. A.—Combustion turbines. 12th August, 1952. (710959.)

20402. Siemens & Halske Akt.-Ges.—Magnetic lens arrangements. 29th August, 1951. (710960.)

20621. Derby & Co., Ltd.—Fluorescent materials. 7th November, 1952. (711068.)

21082. Pye, Ltd.—Television transmitting apparatus. 8th September, 1952. Addition to 656069. (710962.)

21957. Philips Electrical Industries, Ltd.—Circuit comprising capacitively stabilized gas and/or vapour filled discharge tube. 19th September, 1951. (711069.)

22443. Carr Fastener Co., Ltd., and Kay, H. G. A.—Electrical plug connectors. 17th September, 1952. (710965.)

24428. Bristol Co.—Electrical networks. 19th October, 1951. (710889.)

25003. General Electric Co., Ltd., and Griffith, G. W. S.—Thermionic valve circuits. 19th September, 1952. (711072.)

26794. Metropolitan-Vickers Electrical Co., Ltd.—Electric transformers. 29th October, 1952. (711073.)

26946. Cossor, Ltd., A. C.—Electrical connectors. 17th November, 1952. (710969.)

29129. Neugass, E. A.—Illuminated panels. 12th December, 1951. (711167.)

1952

96. Marconi's Wireless Telegraph Co., Ltd.—Time base scanning circuit arrangements for cathode-ray tube deflection. 12th September, 1952. (711170.)

671. Roe & Co., Ltd., A. V.—Means for securing ferrules upon the ends of electrical conductors. 9th January, 1953. (710974.)

1324. Siemens Schuckertwerke Akt.-Ges.—Soldering appliances. 16th January, 1952. (710977.)

1464. Badische Anilin- & Soda-Fabrik.—Production of high-grade dielectric insulations from synthetic thermoplastic substances. 18th January, 1952. (711079.)

1998. General Electric Co., Ltd., and Pickering, I. J.—Electrode holders for arc welding. 7th January, 1953. Addition to 685476. (710902.)

2422. Metropolitan-Vickers Electrical Co., Ltd.—Electron-beam tubes. 29th January, 1953. (711082.)

2816. Egen Electric, Ltd., and Cutler, H. G.—Variable resistances or potentiometers. 2nd February, 1953. (711175.)

5078. General Electric Co., Ltd., and Simpson, A. I. F.—Thermionic valve oscillation generators. 13th February, 1953. (711178.)

5281. Metropolitan-Vickers Electrical Co., Ltd.—A.c. electric measuring circuit arrangements. 6th February, 1953. Addition to 670536. (710981.)

7041. Neale & Sons, Ltd., J., and Neale, M. R.—Reflectors for electric lamps. 19th March, 1953. (710983.)

7748. Philips Electrical Industries, Ltd.—Arc discharge tubes. 26th March, 1952. (711091.)

7800. Marconi's Wireless Telegraph Co., Ltd.—Modulator or mixer circuits. 17th October, 1952. (711092.)

8676. Philips Electrical Industries, Ltd.—Circuits for synchronizing electrical oscillators. 4th April, 1952. (710988.) 9239. Circuits embodying arc-discharge tubes. 10th April, 1952. (710989.)

9401. Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz.—Devices for measuring resistances. 15th April, 1952. (711189.)

9691. Philips Electrical Industries, Ltd.—Electric-discharge tubes for short-wave working. 17th April, 1952. (710990.)

10221. Hazeltine Corporation.—Electrical computer. 23rd April, 1952. Addition to 663225. (710916.)

10754. Philco Corporation.—Cathode-ray tubes. 29th April, 1952. (710992.)

11406. Westinghouse Electric International Co.—Luminescent materials. 6th May, 1952. (711094.)

12100. Bartels, F. J. M.—Electric plug-and-socket connectors. 13th May, 1952. (710996.)

12456. Smart & Brown (Engineers) Ltd.—Mountings for electric lamps. 7th May, 1953. (710917.)

12952. Davies, D. H., and Kirby, F. F.—Electric table or like lamps. 9th September, 1952. (711097.)

13825. Philips Electrical Industries, Ltd.—High-frequency heating. 30th May, 1952. (711099.)

14731. Radio Corporation of America.—Cathode-ray tubes. 11th June, 1952. (711003.)

15154. Siemens-Schuckertwerke Akt.-Ges.—Follow-up control systems for the remote operation of a stage-lighting installation or similar installations. 16th June, 1952. Addition to 700909. (711195.)

15352. Soc. des Piles Wonder.—Flat-cell electric battery. 18th June, 1952. (711100.)

15387. General Electric Co.—Electric disconnecting switches. 18th June, 1952. (711101.)

16389. Behrens, H.—Magnetic separation of impurities. 30th June, 1952. (711006.)

16882. Igranic Electric Co., Ltd.—Control systems for electric motors. 4th July, 1952. (711104.)

17025. General Electric Co.—Electrical connection shock-protective mounts for discharge tubes. 7th July, 1952. (711007.)

17064. Advance Transformer Co.—Transformer for operating electric discharge devices. 12th September, 1950. Divided out of 710852. (710922.)

17321. Licentia Patent-Verwaltungs-Ges.—Electric transformers with pressure resisting casings. 9th July, 1952. (711009.)

18968. Weathers, P.—Transducer systems employing valve oscillator circuits. 28th July, 1952. (710923.)

20026. Standard Telephones & Cables, Ltd.—Thermionic valves. 8th August, 1952. (711114.)

20704. Philips Electrical Industries, Ltd.—Amplifier circuits. 18th August, 1952. (711116.)

21012. General Electric Co.—Luminescent screens. 21st August, 1952. (711015.)

21444 & 21901. Hoover, Ltd.—Suction cleaners. 26th August and 1st September, 1952. (711118/9.)

21971. Radio Corporation of America.—Socket connectors for printed electric circuits. 1st September, 1952. (711016.)

22603. Westinghouse Electric International Co.—Electric circuit interrupter devices. 9th September, 1952. (710925.)

24091. General Electric Co.—Cathodes for electron-discharge devices. 25th September, 1952. (711124.) 25252. Cathode-ray tube deflection systems. 8th October, 1952. (711021.)

26081. Western Electric Co., Inc.—Travelling-wave tubes. 17th October, 1952. (710926.)

27047. Osnabrücker Kupfer- und Drahtwerk.—Plastic coverings on metal-sheathed electric cables. 20th November, 1950. Divided out of 710858. (710931.)

27619. Thrige, T. B.—Apparatus for regulating the speed of electric motors by means of Ward-Leonard control. 3rd November, 1952. (711128.)

29638. General Electric Co.—Control for electrically heated bed coverings. 24th November, 1952. (711027.)

1953

17772. Pirelli Soc. per Azioni.—Oil-filled electric cables. 26th June, 1953. (711031.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—MELBOURNE.—22nd June. State Electricity Commission of Victoria. 500 compression dead end assemblies for steel cored aluminium conductor. (E.S.B. 10632/52. Ten/9164.)*

PERTH.—15th July. Western Australia Government Tender Board. Switchgear. (E.S.B. 11199 and 11200/54. Ten/9210.)*

SYDNEY.—15th June. Metropolitan Water, Sewerage and Drainage Board. One 700 h.p. 5,000 V motor and starter. (E.S.B. 11292/54. Ten/9157.)*

Belgium.—BRUSSELS.—19th May. Belgian Telegraph & Telephone Administration. Rubber covered cable. (E.S.B. 10714/54. Ten/9178.)*

Cuckfield.—12th June. U.D.C. Street lighting equipment. (See this issue.)

Edinburgh. — North of Scotland Hydro-Electric Board. Electrical installation at Invergarry power station. (See this issue.) 132 kV isolator equipment, 33 kV switchgear and auxiliary equipment for Nairn substation. (See this issue.)

India.—MADRAS.—17th May. Electricity Department. Lightning arrestors. (E.S.B. 11207/54. Ten/9148.)*

DELHI. — 19th May. Directorate General of Supplies & Disposals. Railway signalling cable. (E.S.B. 11172/54. Ten/9147.)* 1st June. Cable. (E.S.B. 11160/54. Ten/9141.)* 4th June. Railway signalling cable. (E.S.B. 11175/54. Ten/9155.)*

Keynsham.—1st June. U.D.C. Electrical installation work in 114 houses and 10 bungalows. G. R. Ashton, clerk, Council Offices, Keynsham, Bristol.

Morocco. — TANGIER. — 29th June. Electricity and Water Board. Electrical equipment and transformer posts. (E.S.B. 11268/54. Ten/9211.)*

Newcastle-on-Tyne. 29th May. City Council. Electrical installation in a new aged persons' hostel at Kenton. Tasker & Child, architects, Trinity Buildings, New Bridge Street.

Pakistan.—LAHORE.—19th May. Stores Purchase Officer, Punjab. Cable. (E.S.B. 11368/54. Ten/9166.)*

Seaton Valley (Northumberland).—19th May. U.D.C. Electrical installations in 36 houses at Seghill, 44 at Cramlington and 14 at Shiremoor. T. W. Burgess, surveyor, Council Offices, Seaton Delaval.

South Africa.—JOHANNESBURG.—1st June. Stores & Buying Branch, City Treasurer's Department. Pilot cable, telephone cable and joints. (E.S.B. 11657/54. Ten/9194.)* 3rd June. Stores Department. South African Railways. Paper insulated electric cable. (E.S.B. 11752/54. Ten/9195.)*

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

Southern Rhodesia.—SALISBURY.—1st June. Municipality. Annual supply of the following:—Cable (E.S.B. 11625/54. Ten/9176.)* Switch and fusegear (E.S.B. 11624/54. Ten/9177.)* Line material and conductors. (E.S.B. 11626/54. Ten/9180.)* Cable boxes, lead pipe and insulating material. (E.S.B. 11622/54. Ten/9185.)* Transformers. (E.S.B. 11623/54. Ten/9184.)* Meters and meter spares. (E.S.B. 11627/54. Ten/9183.)*

United States.—DENVER, COLORADO.—25th May. Excitation and battery charging equipment, distribution boards and distribution transformer for Chandler power and pumping plant, Kennewick Division, Yakima Project, Washington. (E.S.B. 11545/54. Ten/9192.)*

ALABAMA.—25th May. Corps of Engineers. Construction of airfield lighting system. (E.S.B. 11601/54. Ten/9175.)*

27th May. Corps of Engineers. Construction of airfield lighting system. (E.S.B. 11705/54. Ten/9208.)*

West Riding.—24th May. County Council. Re-wiring of the electrical installations at schools at Ossett and South Elmsall. County architect, Westfield Road Offices, Wakefield.

Wiltshire.—15th June. County Council. Electrical installation at the new secondary school, Chippenham. (See this issue.)

Wolverhampton.—7th June. Corporation. Street lighting equipment. (See this issue.)

Wortley.—28th May. R.D.C. Installation of electricity in 317 houses at High Green. A. Wikeley, surveyor, Grenoside Offices, Sheffield.

ORDERS PLACED

Barrow-in-Furness. — Corporation Markets and Parks Committee. Carrying out of electrical work at King's Hall (£1,216); revised tender.—North Western Electricity Board.

Billericay.—U.D.C. Group "A" road lighting, Laindon and Wickford.—Cohen Bros. (Electrical), Ltd.

Ealing.—Borough Council Highways Committee. Street lighting columns in Western Avenue (£2,349).—Revo Electric Co.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Abram.—Dwellings (20), Bickershaw estate; J. C. Prestwich & Son, architects, Bradshawgate Chambers, Leigh, Lancs.

Barnack (Northants).—Blocks of bungalows for old people at Wittering; F. J. Lenton & Partners, Broad Street, Stamford, Lincs.

Blackpool.—Proposed St. Wilfreds C. of E. School; Grenfell Baines Group, architects, 12, Guildhall Street, Preston.

Cardiff. — Departmental store, Queen Street; British Home Stores, Ltd., 129, Marylebone Road, London, N.W.1.

Coventry. — Rebuilding premises; Singer Motors, Ltd., Coventry Road, Birmingham, 10.

Old people's home, Bell Green; city architect.

Croydon.—Factory and offices, New Addington Trading Estate; Louis Newmark, Ltd., Prefect Works, Stafford Road.

Derby.—Factory at Osmaston Park site; Wild & Brown, Ltd., ribbon manufacturers, Moss Street.

Dovercourt. — County secondary school; Johns & Slater, architects, 32, Foundation Street, Ipswich.

Durham.—Alterations to Windlestone Hall Special School (£57,775); F. W. Lazenby & Co., builders, Ferryhill, Co. Durham.

Farnborough (Hants). — Factory at Pinehurst; H. & H. Blacknell, Ltd., timber merchants, Union Street, Farnborough, Hants.

Fire station; county architect, The Castle, Winchester.

Frome.—Adaptations at North Hill House to form municipal offices; B. H. Parkes, U.D.C. surveyor, Christchurch Street West.

Harrogate.—Headquarters building for the St. John Ambulance Brigade, 66, Stonefall Avenue.

Hastings.—New fish market; borough surveyor, 37, Wellington Square.

Hendon.—Fourteen blocks of flats (392 dwelling units) in the Spur Road site, Edgware; borough surveyor, Town Hall, N.W.4.

Horwich (Blackburn).—Headquarters and research buildings, Chorley New Road area; J. W. Roberts, Ltd., asbestos manufacturers, Canal Road, Manchester, 12.

Hull.—Departmental stores in King Edward Street; F. W. Woolworth & Co., Ltd., 1, New Bond Street, London, W.1.

Lichfield.—Houses (108), Stowe Street area; D. Oglesby, city engineer, Guildhall.

Lincolnshire.—One-form entry secondary modern school, Market Deeping (£59,125); county architect, Council Offices, Sleaford, Lincs.

Loftus.—Houses (44), Cowscote estate; C. D. Taylor, architect, 41, Baxtergate, Whitby.

London. — HOLBORN. — Office block, Theobald's Road; Sir Robert McAlpine & Sons, Ltd., builders, 80, Park Lane, W.1.

LEWISHAM.—Dwellings (39), Leahurst Road and Lingards Road; borough architect.

PADDINGTON.—New wing to Victory Ex-Services Club, Seymour Street; Humphreys, Ltd., builders, Knightsbridge, S.W.7.

Loughton.—Houses (22), Alderton Hall Lane; Tooley & Foster, architects, Midland Bank Chambers, Buckhurst Hill.

Middlesbrough.—Houses (526), Pallister Park site; J. A. Kenyon, borough engineer.

Nantwich.—Pathology laboratory at Barony Hospital; Cooper Bros. & John Clayton, Ltd., Catherine Street, Macclesfield.

Newcastle-on-Tyne.—Sixty-eight flats and maisonnettes, Elswick Street; city architect, 18, Cloth Market, Newcastle.

Newcastle-under-Lyme. — Licensed premises, Thistleberry Avenue, for Bents Brewery, Ltd.; Forshaw, Massey & Greaves, architects, Trinity Street, Hanley, Stoke-on-Trent.

Newport (Mon.).—Factory extensions; H. Lotery & Co., Ltd., clothing manufacturers, East Usk Road.

North Riding.—Temporary school at Leeming (£14,000); education architect, County Hall, Northallerton.

Perivale.—Additional factory premises; Trepur, Ltd., Bideford Avenue.

Plymouth.—Houses (116), Linketty Lane; W. E. Price, builder, Hartley Vale. Ferry Hotel, Tamar Street, Devonport; Starkey, Knight & Ford, Ltd., 84, Union Street.

Portishead.—Houses (143) and flats (136), Down Road area; U.D.C. surveyor, Library Buildings, High Street.

Rainham (Kent).—Houses (340), Maidstone Road Camp site; J. C. Nelson, Gillingham town clerk, Municipal Buildings.

Reddish (Stockport). — Works extensions, Greg Street; Craven Bros. (Manchester), Ltd., machine tools, Vauxhall Works.

Sheffield.—General reorganization of City General Hospital; Sir John Burnet Tait & Partners, architects, 10, Bedford Square, London, W.C.1.

South Shields.—Block of shops, Market Place, for Ravenseft Properties, Ltd.; L. H. Fewster & Partners, architects, 22, Conduit Street, London, W.1.

Extensions to Town Hall (£75,000); borough surveyor and architect.

Stafford.—Premises for J. Gough Noake, Ltd.; Doffman & Leach, architects, Tenterbanks, Stafford.

Stockton-on-Tees.—First stage of new municipal buildings (£150,000); borough architect.

Surbiton.—Two factory buildings, Roebuck Road; Wayne-Kerr Engineering Co., Ltd., Tolworth Close.

Surrey.—Schools at Shawley Way, Banstead (£54,000), and at the Common, Sutton (£108,000); J. Harrison, county architect, County Hall, Kingston-on-Thames.

Swansea.—Flats (47), Terrace Road, Rosehill; borough architect. Offices; I.C.I. (Metals), Ltd., Waunarlwydd.

Taunton.—Development of site at Lyngford to provide 800 houses, shops, schools, etc.; borough housing architect, 2, Baldwin Road.

Washington (Durham).—Bus station (£11,000); U.D.C. surveyor.

West Bromwich.—Factory extensions, Friar Park Road; J. Finegan & Son, manufacturing confectioners, 279, High Street, Smethwick, 40.

West Ham.—Dwellings (43), Shirley Street and St. Thomas Road; borough architect.

Whitley Bay.—Rebuilding of Masonic Hall, Norham Road; W. Stockdale, architect, 73, Howard Street, North Shields.

NEXT WEEK'S EVENTS

Organizers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

Monday, 17th May

BRADFORD.—Technical College, 7.15 p.m. Bradford Engineering Society. Annual general meeting.

IPSWICH.—Electric House, 7 p.m. Ipswich & District Electrical Association. Annual general meeting.

LONDON.—Savoy Place, 6.30 p.m. I.E.E. London Students' Section. Annual general meeting, followed by film show.

Monday, 17th May, to Thursday, 20th May

TORQUAY.—E.A.W. Annual Conference.

Monday, 17th May, to Friday, 28th May

LONDON.—New Horticultural Hall, Elverton Street, S.W.1. Gauge and Tool Exhibition.

Tuesday, 18th May

LONDON.—Savoy Place, 6 p.m. I.E.E. Education Discussion Circle. "Questions Night."

Grosvenor Hotel, Victoria, 6.45 p.m. Corporation of Industrial Managers, London Branch. Annual general meeting.

Tuesday, 18th May, to Thursday, 20th May

BLACKPOOL.—Public Transport Association. Annual conference.

Tuesday, 18th May, to Friday, 21st May

SOUTHPORT. — Illuminating Engineering Society. Summer meeting.

Wednesday, 19th May

LONDON.—I.E.E. London Students' Section. Visit to G.P.O. Railway, Mount Pleasant E.C.1, at 2.30 p.m.

Grosvenor House, Park Lane, W.1. Gauge and Tool Makers' Association. Dinner-dance.

ST. AUSTELL.—Faraday Hall, 3 p.m. I.E.E. South-Western Sub-Centre. Short papers.

Wednesday, 19th May, to Friday, 21st May

SCARBOROUGH.—Grand Hotel. Incorporated Plant Engineers. Annual conference.

Wednesday, 19th May, to Wednesday, 26th May

LONDON.—Church House, Westminster. International Railway Congress.

Wednesday, 19th May, to Saturday, 29th May.

LONDON.—Alexandra Palace, North London Exhibition.

Thursday, 20th May

DUBLIN.—59, Merrion Square, 6 p.m. I.E.E. Irish Branch. Annual general meeting.

LONDON.—Savoy Place, 5.30 p.m. Institution of Electrical Engineers. Annual general meeting.

Burlington House, Piccadilly, W.1. Royal Society, Conversazione.

Friday, 21st May, to Monday, 24th May

LLANWRTYD WELLS.—Abernant Lake Hotel. I.E.E. Western Centre. Summer meeting.

Saturday, 22nd May

LONDON.—Women's Engineering Society, London Branch. Morning visit to Royal Docks, Woolwich.

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to the dates mentioned :—

28th May

WELCEM. No. 726,208. WELLAC. No. 726,209. Class 9. Electrical apparatus and instruments and parts thereof, all being goods included in Class 9.—Welwyn Electrical Laboratories, Ltd., Trading Estate, Bedlington Station, Northumberland.

RECIPROJET. No. 727,716. Class 9. Air filters for scientific purposes; and electric dust removing apparatus.—Visco Engineering Co., Ltd., 161, Stafford Road, Croydon, Surrey.

5th June

WELCAP. No. 727,686. Class 9. Electrical apparatus and instruments and parts thereof, all included in Class 9.—Welwyn Electrical Laboratories, Ltd., Trading Estate, Bedlington Station, Northumberland.

STYROFLEX. No. 718,306. Class 9. Electrical instruments and apparatus included in Class 9; measuring instruments; calculating, counting, signalling and checking (supervision) apparatus; scientific instruments and apparatus; radio telegraphic and telephonic instruments and apparatus; radio transmitting and receiving apparatus; sound amplifying apparatus; electric condensers; parts and fittings included in Class 9 of all the aforesaid goods; and insulated electric wire and electric cables.—Norddeutsche Seekabelwerk A.G., Nordenham (Weser), Germany. Address for service, c/o Marks & Clerk, 57–58, Lincoln's Inn Fields, London, W.C.2.

PRODILE. No. 728,130. Class 9. Telephone instruments and parts thereof included in Class 9.—A. J. Marek and C. B. Fergusson, trading in co-partnership, 3, Park Lodge, 10, Meadowbank, London, S.E.3.

HARMONY-LITE. No. 727,953. Class 11. Electric lamps and parts included in Class 11.—Victor Norman (Aust.) Pty., Ltd., Hawthorn, Victoria, Australia, and St. Annes Works, Uxbridge Road, Hayes, Middx.

Metal Scaffolding

"Metal Scaffolding," No. 36 in the Ministry of Works series of Advisory Leaflets (H.M. Stationery Office, price 3d), is intended mainly to help the small builder who wishes to erect his own scaffolding or hired components. It deals with simple types of putlog and independent scaffolds for house building and maintenance work up to three or four storeys. A typical scaffold of each type is illustrated to show how the various components are assembled and how bracing should be carried out when this is necessary. Information is given on materials used for scaffolding, spacing of standards (according to the load to be carried), and working platforms; attention is drawn to the importance of tying-in and inspection.